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Five hundred current innovative media projects in 300 colleges and universities are reported here by faculty members responsible for them; these reports are the basis for state-of-the-art evaluations; and both evaluations and reports are arranged in this Higher Education Media Study by fields: instructional television, mediated self-instruction, special multimedia facilities; transparencies, telephone applications, simulation, systems, and media services management. Introductory comments relate media to their instructional use and this study to one in 1963, "New Media in Higher Education." Some of the concluding remarks are that: applications seem to be more adaptive than creative, credible materials of instruction need to be developed nationally and regionally, and housing of media is still inadequate. Indices by topic, contributore, and institution are provided. A "Media Activity Inventory-Directory," the product of two nationwide mail surveys (1966-67) is appended; it is arranged by state, institution, and media project leader. (MF)

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NEW MEDIA AND COLLEGE TEACHING

Edited by

James W. Thornton, Jr.
and
James W. Brown

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FOREWORD

Students of technological societies report that one cardinal principle of technology is its pervasive forward movement throughout any society that introduces it. This characteristic, when applied to the technology of instruction in higher education, would appear valid when this volume is compared to the work, *New Media in Higher Education*, issued by the Department of Audiovisual Instruction and the American Association for Higher Education five years ago. The most obvious changes have been quantitative, but the most important changes have been in new relationships between men and machines. This important change is based on the idea that machines in themselves are the least important aspect of technology, and that the primary concern must be new relationships between men and machines to accomplish clearly thought-out objectives.

James W. Brown directed, and James W. Thornton, Jr., was associate director of, the Higher Education Media Study, from which this book was developed. As editors of both volumes, they have made possible a comprehensive national fund of information and insights on contemporary use of new media technology in higher education. The publisher gratefully acknowledges the leadership and dedication of Brown and Thornton in making this book a reality.

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PREFACE

The Higher Education Media Study was supported in part by a contract with the Bureau of Higher Education of the U.S. Office of Education through the joint efforts of a staff cooperating with the American Association for Higher Education and the Department of Audiovisual Instruction of the National Education Association.

The purposes of the project were —

1. To inventory some of the current (1967) instructional uses of new media of communication in college and university teaching throughout the United States, and
2. To provide critical descriptions of the varieties of such utilization, their accomplishments, and their problems.

The first objective was fulfilled with the issuance of the *Media Activity Inventory-Directory*,* listing some 650 institutions of higher learning at which current applications of many different kinds of new media are being made.

A critical, evaluative report of the 1967 Higher Education Media Study, to which reference is made in the second objective, was designed for the use of state commissions in monitoring allocation of funds for the purchase of new media and related technical equipment under the terms of Title VI, Part A, of the Higher Education Act, Public Law 89-329.**

The Higher Education Media Study used three major approaches in assessing current applications of media in colleges and universities. The first involved the mailing of a postcard request (during August 1966) to some 1,400 college and university presidents throughout the United States. Invitations were issued to all such institutions to submit names of faculty members engaged in "innovations in instruction making use of educational technology including the new media of communication (e.g., computer-assisted instruction, television, electronic carrels, dial access as well as other electronic information storage and retrieval systems, programed instruction, and other unique communication systems)."

This first mailing yielded returns from 286 institutions indicating, in each case, one or more such instances of new media utilization on their campuses.

In October 1966 a similar request, accompanied by a preliminary *Inventory-Directory* of media activities in the 286 reporting institutions, was sent to both the presidents and the directors of public information in all 1,400*** institutions on the original mailing list. This time, an additional 395 institutions responded, thus providing a total of 681 institutions in which new media activities were reported. The results of these two surveys constituted the *Media Activity Inventory-Directory*.

During the period from October 1966 to January 1967, each person whose name had been given by contacted institutions was invited to submit a brief article (1,000 words or less) describing the nature, scope, and outcomes of each innovative use cited. Of a total mailing of 938 such letters, responses were received from approximately 300 institutions describing more than 500 separate innovative media practices. Approximately 114 of these articles have been reproduced in full and the remainder in brief to form the principal content of this report.

The editors sincerely appreciate the cordial cooperation of all who responded to the several requests for information and articles. Without their help, obviously, this book would have been impossible. Any omissions or misinterpretations of information, of course, are attributable to the editors, who regret that they occur in spite of all efforts to eliminate them.

In addition, our gratitude and our indebtedness to several co-workers on the project are immeasurable. Eileen Swartout, A. H. Pruit Tully, Kris von Stull, and Ruth Aubrey all contributed yeoman service in organizing the mailing, keeping track of the responses, collating the information, and preparing the several reports and this manuscript. They deserve much of the credit for the finished product.

Richard B. Lewis participated in the schedule of visits to college and university campuses, participated in planning discussions, and read the entire manuscript before the final typing. The editors appreciate the contributions from his wide experience and deep insight into problems of instructional improvement.

James W. Thornton, Jr.
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* Brown, James W., and Thornton, James W., Jr. *Media Activity Inventory-Directory*. San Jose, Calif.: Higher Education Media Study (434 East William St.), February 1967. 24 pp. (Out of print) Reprinted as an appendix, p. 159.

** Brown, James W., and Thornton, James W., Jr. *Instructional Uses of Educational Media in Higher Education: A Critique*. San Jose, Calif.: Higher Education Media Study, 1967. (Out of print)

*** The study on which this directory was based sought data from approximately 1,400 of the 2,207 institutions of higher learning then established in the United States. Although both the number of such institutions contacted and the number of individuals designated as being active in new media activities represent considerably less than the total populations involved, the sample is believed to be sufficiently large and diverse with respect of type, size, and geographic location to be representative of new media activities in higher education throughout the country.

I

INSTRUCTIONAL FUNCTIONS OF NEW MEDIA*

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THE introduction of new media of communication into traditional instructional patterns of higher education requires careful consideration of both the purposes of instruction and the potentials of technical apparatus. The harmonious orchestration of human and technological resources in this instructional performance is the basic concern of this report.

Instruction for our purposes is viewed as a complex pattern of activities and materials used for stimulating, encouraging, and guiding complex human learning. It includes aspects of both teaching and learning. The objective of this first chapter is to aid in the search for ways of providing the most favorable conditions in which human learning may occur. A special emphasis is on ways of achieving optimally effective and interrelated instructional combinations of human capabilities and talents with communication facilities, materials, and resources.

A second major purpose of this chapter is to raise questions and to suggest some alternative answers rather than to propose categorical and single solutions to the problems. Surely it is true that multiphasic problems require pluralistic solutions.

The breadth of the subject of "new" media and their uses in higher education prohibits thorough treatment during this single essay. It is necessary, therefore, to be selective in proposing the means of finding answers to a few germinal and provocative questions and of developing solutions to fundamental problems.

A consistent viewpoint underlies this discussion of instructional technology: that human talents and academic performances can be most validly assessed within their physical and social contexts. Human actions are closely interactive with the materials, tools, and instruments that make possible associated performances. Ideally, human performances and the necessary supportive apparatus should be considered as integral parts of the same design or same plan of work; the actions of people are integral parts of all technology, and technology includes the essential performances of people. These facts apply especially to instructional communication and the uses of the media.

SOME BASIC PROPOSITIONS

There are several propositions of fundamental importance to both theory and practice of instruction, provocative of systematic thought about teaching and learning and contributory to a good perspective on this area of education. These propositions also summarize many limited facts and serve as introductions to the descriptions of applications of educational technology and innovative processes in colleges and universities that form the body of this book.

The first statement expresses in highly condensed and generalized form a definition of the full responsibility of the whole educational system in America: *The whole educational job is to provide appropriate opportunities and conditions in our society for each person to learn what he needs to know and what he has the assured right and the abilities to learn wherever he lives in this nation and whatever the time and condition of his life.*

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* This paper was prepared originally for the National Conference on Curricular and Instructional Innovation for Large Colleges and Universities, sponsored by Michigan State University and the U.S. Office of Education, November 6-11, 1966.

Within this broad generalization may be formulated national goals for the educational system. The role and scope of higher education in the nation's total educational system urgently need to be made clear before the respective contributions of people and technologies and the role of professors and students can be rationally and validly defined. Apparently a major prevailing condition of all universities in America, especially the large public institutions, is that their educational activities are already generally overextended in relation to the means usually provided, although this condition is changing rapidly. So much of so many different kinds of work is expected of universities that these expectancies cannot possibly be fulfilled; hence, there are always unfinished jobs, and the people who hope for more than is accomplished become disillusioned. As much work always remains to be undertaken, it is most difficult, if not impossible, to develop the specifications and requirements for people, technologies, funds, and facilities needed to do all the jobs that universities are expected to do. In brief, within a definition of the whole educational task in America, national goals should be formulated, and within these the roles and purposes, functions and performances of institutions of higher education need to be specified even for those tasks which cannot yet be undertaken.

A second challenging general proposition is this: *Education is an unlimited enterprise. There are no boundaries to the needs, uses, and desires for more learning, more understanding, more skills, more technology, and more intelligent regulation of the physical and biotic forces of the world environment. Sustained educational effort will never be outmoded.*

Learning creates needs for more learning. From the mastery of one task grows the imperative need to master other tasks. Throughout life changing needs spawn requirements for unlimited adaptive developments and continued learning. The same pattern of thought can be applied to research. Research gives rise to needs for more research, and the results lead to new possibilities for additional developments and applications. The solution to one problem often helps define a family of other problems, each one clamoring for solution.

The stored knowledge of the past and of the present, if it is to be intelligible, needs to be continuously restructured and reinterpreted. What we call knowledge should be persistently reassessed within the context of new facts and perspectives, new systems of information, and new interactive discoveries. Just as the body of knowledge is perpetually evolving, so it is true also that no man's education is ever complete. The needs and responsibilities of the educational enterprise are truly unlimited.

This generalization has reference to needs and demands; it raises questions about what processes and conditions do actually limit and set boundaries to the performances of colleges and universities. To explore this problem, it is necessary to examine the validity of such limiting factors as the part of the gross national product that is invested in education, the scope and quality of prevailing educational plans and policies, the flow patterns of funds and their specific allocations, the amount and kinds of facilities available, and the range and qualities of human capabilities and performances that are committed to the achievement of educational goals. The operation of a limited educational system within a field of unlimited needs and demands justifies intensive study of the technologies of education. The problem posed by the gap between facilities and needs calls for the greatest of educational statesmanship, guided by objective intelligence and evidence rather than by nonadaptive and institutionalized attitudes.

The third general proposition is in part a consequence of the preceding proposition, and it relates even more closely to the theme of innovations in curriculums and instructional programs: *The work of universities for the near and more truly for the distant future cannot be done fully and well by traditional educational operations, methods, and procedures.*

Developmental changes in the operations of colleges and universities are urgently required if all of the educational categories of the people are to be served educationally as they should be served. All citizens have basic rights and legitimate expectancies to be served in appropriate fashion by our public institutions. There is needed a restatement of the criteria currently used to determine who shall be served by the higher education establishment. Two other questions follow: What educational services shall be provided? How are these services to be made effectively available? These redefinitions of the clientele and of the responsibilities of higher education surely will vastly increase the magnitude of the so-called "numbers problems," particularly for publicly supported colleges and universities. These institutions are chartered to provide education and training for the citizens of their states, some of whom are now termed the *disadvantaged.* One of the most urgent needs in higher education is a realistic evaluation of the educational potentials of the disadvantaged and of the development of imaginative and effective techniques to maximize these human potentials. It is no longer permissible to dismiss the educational aspirations of these citizens with the statement, "They are not college material."

There are no alternatives to dealing with and serving increasingly larger numbers of both young and mature people, of private and public interests; the problem is that of effectively, humanly, and efficiently serving all those people who have legitimate demands for the services that universities were originally founded to provide.

The fourth generalization is two-pronged: *First, there has developed and matured a communication revolution which in unique ways corresponds to the industrial-power-energy revolution that is still in rapid progress. Second, the technological developments of the communication revolution are eminently appropriate and applicable to the solution of many if* *not most of the educational problems which confront the growing universities and the nation.*

The communication revolution refers to many discoveries, inventions, developments, and their applications. The long list encompasses generally all those technologies, including the knowledge and skills of people, which serve the functions, or are associated with the processes and the management, of the information-education enterprises: inscribing or encoding information; ordering or organizing it; preserving or storing it; recovering or retrieving it; transforming or interpreting it; reading or scanning stored knowledge; and developing the uses and applications of knowledge.

The communication revolution touches all phases and parts of that cycle of events extending from the generation or creation of new information to its varied uses and applications. The development includes a vast range of technologies, many of which are not often recounted in the blinding glamour of more recent physical and electronic developments. Included are the modern technologies of the carriers of signals, signs, and symbols; the raw materials of communication and their processing; the availability of a vast catalog of "solid state" holders and carriers of information, knowledge, and readable records. Paper, plastics, and magnetic fields; beams, waves, and lasers — all materials and processes which serve as holders, carriers, and vehicles of transmission of coded information and language — all are parts of the great and modern technological communication revolution. The cultural and social evolution includes, therefore, printing and the production and reproduction of graphic and photographic information as well as the latest electrical and electronic technologies. Publishing and printing and the associated auxiliary enterprises are included in the classes of "new" communication media just as surely as are the broadcasting industries. These are all very recent developments in the long historical time perspective of the evolution of human languages and communication.

These four broad generalizations provide a kind of frame of reference within which the theme of communication technology and innovative change in higher education can be focused and the specific problems stated.

The four generalizations can be summarized by pairs of statements and questions:

- The whole educational job is to provide favorable learning conditions for people who have the needs, rights, and abilities to learn. How can this be done?
- The needs-demands aspects of higher education are unlimited, but educational operations are limited, bounded, and restricted. What are the conditions, including human factors, which set undue and nonadaptive limits and boundaries to educational services and activities, and how might these limits and boundaries be made more coextensive with the needs and demands for educational services?
- The kinds and amounts of work of higher education, however defined, cannot be accomplished fully by traditional approaches, methods, and procedures. What are the means potentially available that will make it possible to accomplish more nearly than at present the goals that are expected of colleges and universities?
- There is in progress a true revolution in the sciences and technology of communication and information management, and many parts of the products are applicable in education. What parts of the technologies of this development are applicable to the tasks and requirements of education for which colleges and universities are generally responsible?

THREE MAJOR CONSIDERATIONS

Given the extraordinary kinds of products in the modern communication fields ranging from high-speed printing presses to synchronous communication satellites, selections must be made of those facilities, components, and systems which may most appropriately and feasibly serve instruction. There are some kinds of products for which higher education is the prime consumer. They are accepted and purchased in large quantities. Examples of these are the full range of technologies and products related to printing and publishing, to telephone communication facilities, and more recently to computers. The publishing industries with their great ranges of books, journals, and informal printed and duplicated materials are intimately and organically linked with universities in both the production and the consumption of their products. The telephone service charges of colleges and universities are major budget items, and telephones are used extensively for both internal and external communications, although rarely for direct instruction. Computers, in successive generations of increasing complexity and speed, have become necessary to the administration of colleges, important as institutional status symbols, and exciting as monitors of instruction.

These are examples of technologies which have had extensive and rapid acceptance by universities for serving some kinds of communication and information-processing functions.

On the other hand, some products of the communication revolution have been accepted only slowly or erratically by higher education. Several techniques described in later sections of this book have been enthusiastically adopted in a few institutions but have failed to achieve the vogue of the computer and the telephone. Telecommunication for use in extension and off-campus instruction and training, special-purpose buildings and facilities for use with large course enrollments and multiple-section courses, and electronic systems employed for testing, examining, and providing academic status reports directly to students are three examples of available and proven technologies which are having relatively long latent periods of acceptance and delayed minimal uses.

It can be observed, therefore, that *some components of communication technologies are extensively and rapidly accepted by universities while others are not so accepted.* Why is this the case? This disparity provokes many questions that can be fruitfully explored. For instance, do those technologies which are accepted have high "face validity" in the accomplishment of perceived and defined tasks of higher education? What are the correlations of costs, both original and operating, with the rate of acceptance? What have been the effects of federal government and foundation grants and contracts on the kinds and rates of innovation that have been accepted to a significant extent in universities? Do federal and foundation programs consistently increase the rate of acceptance of innovations? Does the use of the innovation persist after the grant has expired? Are there areas like curriculum and instructional methodologies within universities which are more resistant to adaptive developmental changes than other areas like institutional administration and research programs?

A second consideration is the *relationship of the kind of technological development to the kind of instructional function which needs to be served.* In the invention and development of communication technologies, whether in the auditory or visual sensory modes, display equipment and the procedures for displaying and presenting pictures and sound have been emphasized. High-fidelity stereophonic sound reproduction and color cinerama motion pictures, color television, and the improvement in photographic journalism represent great advancements in the technology of displays, distribution, and presentation of information and stimulus materials for learning. By contrast, the technologies which evoke, guide, and reinforce overt learning responses, practice, and skills development have been seriously neglected. It may be that these irregularities in development of communication technologies have direct relationships to the acceptance of technological innovations by colleges or universities. In our society, technological advances are most often responsive to profit-earning potentials, but not necessarily to the needs of the larger society for such advances.

A third consideration is *selection and building of parts and components of communication technologies into practical systems* for serving all of the essential functions for facilitating complex human learning. The selection and development of technologies into assemblies and systems that match and meet the full requirements for optimizing conditions for learning is a problem that has been clearly formulated for 10 years or more but that still remains to be solved. The assemblies currently being associated with computer linkages are notable examples of inadequate equipment. Integral systems of equipment are needed which provide all of the conditions and requirements for teaching and learning or, as defined in this essay, for integral instruction. Still prevailing are proposals for the single-component solutions to the exceedingly complex problems of human learning. Neither transparencies nor dial-access language lessons; neither videotape machines nor instructional television fixed service; neither computers nor synchronous communication satellites — none of these can, as separate components or subassemblies, provide the full range of the conditions for ideal instructional systems. These systems, it must be noted, will always include the associated human actions and interactions, the human factors.

Why are components of communication technologies so very limited, relative to all of the requirements for complex human learning? Why have there been such long delays in developing and demonstrating fully integrated systems of instruction-learning conditions and equipment? Is it possible that the time latencies and delays in technological developments in higher education are to an important degree due to the real limitations of performances relative to the full requirements for superior instruction and good conditions for learning? Are these requirements different from the criteria by which the equipment is evaluated? Are there overdevelopments in some aspects and retarded developments in other aspects of our educational technological resources? Which technologies can and should be introduced into the universities? What procedures may be most useful in defining and writing specifications for new and needed educational developments?

Discussion of these three major considerations — selectivity, disparity in rates of development of aspects of technology, and the need for unified technological systems — may be summarized by three questions:

First, a long time perspective is required for judging the rate of acceptance of technological changes by colleges and universities. Within such a historical perspective, what is the present state of the art in curriculums and instruction?

Second, is it not possible that when new technologies become available which are truly appropriate and feasible for the solution of curricular and instructional problems, and these characteristics and performances are well demonstrated, the first essential steps in the sequence of events leading to innovation have been taken?

Third, is it not possible that the research and development programs in the areas of technical and human resources have been shaped to an important extent by the patterns of acceptance and use of the results? For example, single-variable and ideally controlled research on the determinants and conditions of learning is most important theoretically, but nevertheless the results of this kind of research lead to long latent periods in the development of multivariable and multiphasic total systems and conditions for motivating and regulating complex human learning.

MATCHING PERFORMANCE ANALYSIS OF EQUIPMENT AND REQUIREMENTS ANALYSIS FOR COMPLEX LEARNING

The vast array of technical equipment now available to universities has been designed generally for purposes other than education. Apparently to a very limited extent only have the clarity of specific requirements and demand for specialized facilities for instruction led to the production of marketable products. There are textbooks and many associated printed materials which have been provided and well accepted for scholarly work and instruction. In the area of university research, special buildings and complicated new apparatus are often essential, and they are designed, funded, and fabricated without delay. Why is it, then, that the instructional classrooms and laboratories of new university buildings are so similar to those built hundreds of years ago? Can it be that educators simply do not know how to provide space and equipment appropriate for complex human learning and for the personal and academic development of students? If this assumption is correct, then the disparity between the facilities available and those truly needed for curriculum development and instruction on the university level derives from inability to write adequate specifications for the apparatus. These specifications, if they could be prepared, would be useful (a) for guiding the new and greatly expanded information-handling industries and (b) for selecting equipment items from among the vast arrays of facilities now on the market. Finally, the specifications would aid in the invention and development of really new items and systems of instructional instrumentation.

The difficulties in writing building and equipment specifications for instructional functions can be realized when the extensive research results on learning behavior are reviewed and the question is asked: How are these research results to be applied in actual university instruction? The difficulties are emphasized further when complex general-purpose equipment like computers, instructional and broadcast television, and language laboratories are introduced into a university, and attempts are made to build them solidly and enduringly into the university's instructional programs — and budgets! The limitations and advantages of equipment are discovered when it is used in course and curriculum development work where high-quality learning is required and where learning performances are validated with samples of students from the target population.

The assumption at this point is simply that *the right kinds of equipment to perform the needed, realized, and defined functions of instruction have a high probability of being accepted and used in university instruction.* Equipment which has been developed for other uses and other markets, but sold to universities, is all too often inappropriate for the teaching-learning functions that are mediated, and this lack of appropriateness likely retards acceptance and use.

Great improvements are needed both in the techniques of examining and appraising existing equipment for instructional use and in the development of

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new resources and equipment of advanced design for use in curriculum reorganization and instruction. It seems obvious that much new equipment does not meet the minimum requirements of appropriateness for university instruction and hence should not be accepted by teaching faculties.

The problems of equipment selection for use in instructional programs may be summarized in the following questions: What are the best procedures for determining equipment specifications? How are the various requirements for stimulating and regulating learning behavior to be formulated and made useful for guiding the selection and development of instructional equipment? How can effective cooperation be established between university faculties and the developers and producers of instructional materials and equipment?

PHASES OF THE INSTRUCTION-LEARNING CYCLE

(LARGE CLASSES)

The instruction of large classes and multisection courses is strongly established in colleges and universities. Although large classes often are criticized, such arrangements may be most useful as means for carrying out some kinds of instructional functions. Large classes will probably continue to be scheduled as one means of dealing with large numbers of students, partly because they make possible other arrangements to realize the ideal of individualized instruction. Large class meetings do not preclude the use of other complementary instructional and learning procedures for serving other and different functions. The problem of the large class or multisection course is a good test case to consider for applications of new technologies.

Specialized classroom buildings, seating from 1,000 to 3,000 students, are being constructed and equipped in American universities. Descriptions of several are presented later in this report. There are very special and interesting problems involved in equipping buildings or classrooms which are designed for use by large numbers of students. The building typically provides the characteristics of the general learning environment. Internal climate control, excellent acoustics and lighting, seating and spacing of seats for comfort, and arrangements for efficient student traffic flow all are required. Within these large classrooms, the instruction-learning cycle begins at the point when instructional materials of proven quality are available. This cycle has several definable phases.

Phase one is *the display-perception phase*. Included here are all the kinds of apparatus used in presenting stimulus materials to a large class. Generally these presentations are in the visual-auditory modes. For this first phase a multimedia room includes an array of varied kinds of equipment and materials. The first problem is to select instructional materials in order to give the instructors the needed ranges of alternatives for efficient, dependable, and high-quality presentations and displays. The great fault of present-day display apparatus is that the integral systems of equipment have not been developed for use with existing and possible new varieties of instructional media ranging from 8mm film through videotape displays to cinerama-type color films. Accordingly, display arrangements that use the increasingly popular rear screen approach are accurately described as "lash-ups" of equipment components. The assembly of disparate parts may be the only present alternative, although the possibility of equipment development using systems designs and simplification procedures is worth discussing. Nevertheless, the fact remains that at present the display of stimulus material is very highly developed compared with equipment that is available for implementing the other phases of the instruction-learning cycle.

The second phase is *learner interaction-and-response*. Despite the prominence of this second phase in the reports of research and learning theory, the practical equipment for instrumenting this second phase of the cycle is retarded compared with the equipment for display. There are special difficulties. Very large numbers of student response stations need to be provided for large classes and for multisection courses. Waiving the question of what should be the kinds of responses, the problem of mediating these responses must be solved, not only for individuals working alone but also for those working in groups up to 1,000-1,500 or more. Instrumentation of this phase is an essential but still underdeveloped step for connecting phase two with phase three of the cycle.

Phase three of the learning cycle includes the step-by-step *reactions of students to stimulus materials*, coupled with feedback and reinforcement. These reactions may be to scales, solutions to problems, queries, or decisions. The acceptance, routing, and processing of the students' responses by electronic equipment can follow several courses, but at first all responses must be fed into a special-purpose computer for processing and possibly temporary storage. The first important use of these records is to provide students with assessments of their reactions or to help the students assess their own reactions to stimulus materials. This must be done rapidly and in proper form. Generally, presentation of results and guides for assessments can be made for all students over the same display equipment that is used for instruction; special problems of individualization may make it necessary to provide for on-desk displays of reinforcing feedback to each student. Second, summarized assessments, perhaps in statistical or analog form, should be available to the instructor. Of these two uses or channels, the most important is the evaluation which is fed back rapidly to the students. The third use of the students' response inputs to the computer is for the analysis of specific learning responses and the evaluation of the record of the learners' performances and achievements. The special-purpose computer will need to have a very high rate of acceptance of responses. It can be linked with a large general-purpose computer for some kinds of data analysis that do not involve immediate feedback-reinforcement mechanisms and can be delayed until asked for by the instructor.

Phase three as described requires that conventional testing and evaluating functions be made integral parts of the instructing and learning processes, and that assessing the students' performances be considered an essential part of the instructional cycle. These suggestions do not exclude the possibilities of presenting periodically, as needed, other kinds of special tests and examinations of students' achievements. The same apparatus system often can be used for these testing purposes and for presentation of instructional materials.

Given the building and equipment as briefly described, the multimedia facility provides potential means for rapid and effective assessment of instructional materials by means of students' reactions to them. In the face of the communication revolution, the selection, organization, preparation, and production of instructional materials can no longer be required of each individual instructor. The job requires curriculum and course development laboratories and centers where learners' reactions and test results are used to assess the effectiveness of instructional materials even during the early stages of production. The buildings and equipment suggested for instructing large classes could serve as realistic proving grounds or part of the production center where the qualities and effectiveness of materials can be validated with adequate samples of students. Furthermore, these modern buildings may be suitable for the systematic analysis of teaching behavior.

Questions that arise from consideration of the phases of the instruction-learning cycle include the following: How can colleges and universities provide buildings and equipment that are both possible and necessary for teaching large classes and multisection courses? The description of use of equipment to effectuate the learning cycle assumes new buildings and some new equipment that is not yet developed, or at least has not yet been arranged in a functional system. What consideration needs to be given to renovation or remodeling and equipping of old buildings and existing large classrooms or auditoriums? Can closed-circuit and broadcast TV programs be produced and presented in such ways as to require, record, and assess students' responses, with "knowledge of results" reported quickly to students? Is the learning cycle model a useful one to use in beginning to define performance requirements and standards for instructional materials, equipment, and methods?

MISUSE OF INSTRUCTIONAL FACILITIES

One approach to the many problems of educational technology is to study the misuse of instructional materials and resources and the required competencies of faculty members and students for using them. A frequently found misuse in fields of communication is employing modes of presentation which do not fit the information or symbol systems needed to display the information to the best advantage to students. Even speech and the printed word, the traditional modes of instruction, are sometimes misused. The lament about too much lecturing is heard wherever teaching is discussed. Pictorial and graphic modes of representing information also may be misused. The problem raised here is one of the fitness of symbols to content and to the requirements of instruction. This is a complicated problem indeed, and one which includes as well style, format, and especially organization of instructional information and stimulus materials. What may be required are new ways of determining the optimum fitness and the best mix of modes and symbols into patterns of instruction.

There are possibilities for misuse of very expensive and complex communication apparatus. Some examples are found in the employment of TV broadcasting stations on the regional or national network scale for the instruction of a relatively small number of individuals. Similarly, closed-circuit TV systems, radio facilities, and computers may be committed to teaching tasks for which they are not appropriate or which use only a fraction of the available information-processing capacity of the equipment. In general, it may be said that mass media are better not used with small groups or for limited individual instruction, except in experimental or research applications.

A general prescription for avoiding serious misuse of instructional facilities has two parts: The materials and equipment should be designed, selected, and used to serve specific functions of teaching and to provide the best possible conditions for learning. Second, there should be a close matching of capacities of the technology with instructional requirements. Furthermore, regardless of fashions and fads in educational facilities the simplest and most economical equipment that will perform well the defined and required instructional functions should be employed. In brief, solving the problem of determining the most appropriate uses for equipment requires the best matching of functions and capacities with the demands of instructional tasks.

Studies of the cost of instruction that is mediated by closed-circuit television compared with multisection courses taught in small classes by individual instructors have highlighted the very great economic advantages in distributing and presenting programs of "instruction" to large number of students. When TV instructional programs of high quality and effectiveness are available, then increasing the number of students served very rapidly decreases the per-credit-unit-cost of that part of instruction. The same economic advantages can be realized by extending the use of large special-purpose instructional buildings with large classrooms and other media systems.

Generally increased use and lowered costs can justify economically the recording and broadcasting of programs within a single university or to a number of cooperating universities or colleges. However, using the principles, methods, and procedures that we now know how to use, the costs of empirically produced and tested course materials are so great that they can rarely be borne by one university alone. The cooperative production of these materials, spreading costs over a number of universities or higher educational systems, is a most promising approach. We need to learn how to manage these operations by careful studies of examples that have succeeded and of some that have failed.

The following questions may be appropriately raised and discussed: Should the same kinds of controls on cost be applied to instructional facilities and their operations as are applied in private industries and businesses? Under what conditions can extraordinary costs of instruction be justified? When is it shown to be clearly desirable and feasible for a number of universities and colleges to cooperate in producing and using instructional resources of high quality? What are the positive incentives and rewards that can be used to encourage faculty members in different universities to cooperate in production and shared use of instructional resources? What are the special problems in producing instructional materials for electronic media?

DISTRIBUTIVE CAPABILITIES OF COMMUNICATION TECHNOLOGIES

Reference has been made to the fact that display and presentation capacities of communication equipment are very highly developed and that these capacities exceed the levels of development of other characteristics of the electronic media that are needed to serve instructional functions. In addition, distributive capabilities have surpassed those of the display and presentation.

In Japan, cultural and educational programs are being distributed by two channels for complete national viewing over the great network known as "NHK." This intensive and extensive distribution of educational programs is a most remarkable achievement. There is scarcely a village throughout that mountainous island country in which educational and cultural influences of NHK cannot be observed. The effects are on a significant scale; there can be said to be a "quantum difference" in the lives of rural and small village people that is directly due to these televised programs.

Telephones, radios, television networks, and printed publications are ubiquitous in their distribution functions throughout most Western countries. We need not belabor the point: Communication distribution systems are already highly developed. Synchronous satellites are extending and increasing distributive capabilities and channels of telecommunication media that can and may be used for some kinds of educational and cultural purposes. The Midwest Project for Airborne Television Instruction (MPATI) has demonstrated on a relatively small scale a model of what satellite transmission networks may become by 1970 with satellite-to-ground-stations transmission and by 1975 with powered satellite-to-home and school receiver transmission. Distributive and display characteristics of communication-instructional equipment are already more than adequate.

The following questions, then, seem pertinent: In view of revolutionary developments of recent years, what are the instructional inadequacies of present communication media? Why does it appear that these media, so closely aligned in their characteristics with critical needs of higher education, are serving those functions only peripherally? What are some constructive actions which may now be taken to move available but unused instructional resources from the periphery into the central educational operations?

What should be the role of the Regional Educational Laboratories which are now being built in developing curriculums and courses and demonstrating instructional innovations? Are there other developments which have not been imagined or proposed that could beneficially affect the uses of technological and human resources in large universities?

How can large universities with their extended campuses and branches best use for instruction the storage, distributive, and display-presentation capabilities of modern telecommunication equipment? What are the promises of applying the concept of transmission of instructional materials to students and adults rather than requiring them to come where the instructional materials are traditionally located? What are the advantages and limitations of *academic living centers* with dormitory, classroom, individual study, and social activity functions planned for and built into a single architectural complex? What actions should be taken to demonstrate on-line student access to useful information about student performance, academic plans, and intensive instruction?

SOME POSSIBILITIES OF IMPROVING INSTRUCTIONAL MATERIALS

It is likely that in spite of the fitness of technological communication developments, and especially the characteristics for information storage, distribution, and display, inadequate instructional programs are retarding acceptance and use of these developments and applications of their capabilities in higher education. The qualities of media programs for motivating and shaping learning urgently need to be improved. How then do colleges and universities proceed with this task?

The first step is certainly to realize that *the instructional operations of planning, developing, writing, organizing, producing, and testing programs of instruction are quite specialized tasks requiring different human talents and separate physical facilities.* Colleges and universities, perhaps working in regional cooperation, can build and staff new instructional materials production centers where functions of program creation can be carried on. In such centers the quality and effectiveness of instructional materials would be tested and improved. The amounts and kinds of learning of samples of the target student population would be tested, and the materials revised on the basis of findings. It does not now seem possible to produce really high-quality instructional programs by using only the procedures and formats of the lecturer, panel discussion, or unadorned live programing. New hunches or guesses, new hypotheses, as well as traditional procedures in preparing materials for learning must be tested by student interactions and by measurements of their effects on student behavior. Tests most often lead to revisions; and when these revisions are themselves tested, new revisions are indicated. Constant revision of programs — year after year — is needed. Although difficult, laborious, and expensive, such work is sufficiently important to require new buildings and new configurations of equipment in instructional materials production centers.

A second step in the process of improving instructional materials is to bring about *a realization that procuring, scheduling, and distributing programs also will require special physical facilities* — principally offices and videotape machines coupled with switching centers and linkages via cables or microwaves to transmitters. Many such facilities already exist. It is into this set of functions that synchronous communication satellite retransmission will fit when this development becomes a reality. As a consequence of these developments, when properly financed and operated, the amount of simultaneous (live) telecasting will be reduced, but the amount of recorded, proven, and tested instructional programing will be greatly increased.

The third step in this move toward improvement of instructional materials is to *provide appropriate facilities in which to present instruction.* Some of the spaces now available for improved instruction are described in the following chapters, but new concepts of "places for instruction" are appearing. The university of the future will continue to use large multimedia auditoriums and classrooms and seminar rooms; but it also will provide much instruction by means of transmission to distant dormitories, fraternities, or even homes in other cities. The necessity to assemble for all instruction will be de-emphasized, and more opportunity will be afforded for the student to learn when and where it is convenient to him.

The fourth essential and corresponding development which will significantly increase the quality of instructional materials, and incidentally a procedure which is absolutely basic to the successful introduction of all innovations in higher education, is the *conduct of faculty training and development programs.* No new technological innovations or important changes can occur successfully without the reeducation and retraining of the people who must accept and apply the innovations and who are most affected by them. The successful example of the training of faculty members for using computers provides a good model. Training is needed for using effectively new learning resources including such developments as language laboratories, multimedia science laboratories, new computer-assisted library operations, high-speed mark-sensing test scoring equipment, closed-circuit and broadcast television, films, projectuals, and sound recordings. Much more faculty training will be needed for use of the proposed instructional materials production centers if they are to become important facilities in large universities. Considerable training is needed for students as well to use new and different kinds of instructional resources. What is proposed is an educational retraining approach to problems of educational innovations.

Faculty members have long-standing and firmly established attitudes and value judgments about methods, procedures, and techniques of teaching. These attitudes and opinions are often in conflict or inconsistent with attitudes that are necessary for uses of some kinds of new educational technologies. Changing such attitudes may be as difficult as developing new instructional and learning performance skills. Three lines of activity will provide a minimum approach to these changes:

- *Faculty and student training and development programs* in instructional performances are necessary for the introduction, acceptance, and use of new kinds of educational technologies.
- *A rational educational and informational approach* is also necessary for restructuring the attitudes and value judgments of students.
- *Administrators, responsible government officials, leaders in professional content fields, and the general public* need to be thoroughly informed about programs and uses possible through new educational technologies.

Finally, the question is raised of why the creation and production of new and modern instructional programs for higher education should not be done by private industries. Publishing companies and not university presses have produced textbooks and other materials. The new publishing-electronic combines may view the production and marketing functions as belonging to them. Surely this possibility should be considered.

There are many other related questions: Are the textbook publishers good models for new organizations that plan to produce the instructional materials of the future? Will cooperative relationships need to be developed between universities and the new instructional materials industries? What body of evidence supports the proposal to separate creative programing from distribution and uses of instructional resources? How are marketing and inventory functions to be served? How will the places where learning occurs be provided and managed? What should be the functional specifications and designs of modern instructional materials production centers?

CHANGES IN ROLES OF PROFESSORS AND STUDENTS

The new developments in instructional technologies which prove to be useful to colleges and universities put greatly increased teaching power at the disposal of these institutions. The faculty members who have legitimate rights and responsibilities for managing and using these developments are those who can contribute most to extension and improvement of instruction. New opportunities exist, therefore, for groups of faculty members to become distinguished teachers by mastering the demanding tasks inherent in modern educational technologies in addition to mastering the subjects of their fields.

Early fears that communication technologies threaten to displace and lead to unemployment of faculty members have now been proved false. Even where new electronic media are used extensively, there has been no loss of jobs. This is due, in part, to the fact that education itself is a relatively unlimited enterprise and has been expanding constantly. However, two developments occur when technologies are used: First, professors are required to learn new kinds of performance skills; and second, a large number of new kinds of technical assistance become necessary.

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The first of these developments may prove to be the most difficult to achieve, even though universities have great degrees of freedom for both faculty members and students to change and adjust their roles, patterns of work, and styles of living. New educational technologies will affect and produce change in the ways faculty members and students live and do their academic work.

The second development will require faculty members to learn new skills and to accept the assistance and cooperation of many kinds of technicians and specialists. New patterns of work result from the introduction of new technologies into a university system. Educational institutions need some degree of separation and protection from the pressures of their contemporary cultures; nevertheless, the universities of today, and the people in them, are surely influenced by the modern communication revolution. Universities cannot escape from the effects of the age of technology which they have helped to create. It is reasonable to expect that when conditions of work are changed and new kinds of resources are available for conducting educational programs, when new definitions are written for educational missions, and when new conceptualizations of processes of instruction are developed, then there will be and must be appropriate and adaptive changes in the roles of both faculty members and students.

Conventional descriptions of the roles of both professors and students in universities are quite generalized. Stereotypes of these roles — referred to as teaching, research, and service — can surely be analyzed into more ordered and specific taxonomies of functions and performances. The following list of activities defines the jobs of conventional instruction more usefully for our present purposes than do the more traditional and general stereotypes:

- Selecting content or stimulus materials
- Organizing the content
- Arranging the content in detailed order and sequence for learning
- Selecting the modes of communication and presentation
- Producing, transforming, and patterning the content into selected modes
- Providing instructional materials in suitable forms for access by students
- Testing the effectiveness of the materials
- Making presentations to students or learners
- Regulating interactions of students with instructional materials
- Assessing or evaluating student reactions, performances, and learning activities
- Evaluating students' general achievements
- Collecting information and using it to revise and improve instruction.

The preceding 12 steps complete a kind of instructional cycle to which, before repetition, could be added two other conventional operations:

- Revising and evaluating details of the course on basis of student responses
- Revising and modernizing instructional materials based on new knowledge and emerging technologies.

It would be interesting to develop a similar list of performances, at the same level of generality, for students.

The following observations and judgments may provide a useful basis for further planning and experimentation:

- The full range of teaching functions and their corresponding performances at the university level have now become so complex and demanding that it no longer seems reasonable to expect any single teacher to perform all of them satisfactorily. Instruction will progressively require differentiation and specialization of roles. Teams of people with different competencies and responsibilities will be needed to do a complete and balanced job of instruction.
- When available technologies and procedures are appropriately used to assist in conducting the main functions of instruction, the problem then becomes one of determining what functions (or part functions) can best be served by what patterns of technologies, by teachers, and by learners.
- The use of instructional technologies, in most cases, increases the number and kinds of specialists and technicians who work with professors in producing programs of instruction.
- The use of appropriate technologies may reduce the demands on teachers and students in some categories. For example, conventional instruction places heavy demands on professors in the category classified earlier as presentations and displays. Techniques of producing, storing, recording, and distributing instructional materials on carriers of information and for presenting and displaying them permit a greatly reduced demand on teachers in the category of display or presentation of information.
- The applications of instructional technologies make it possible to introduce new categories of operations into instruction. Here there are two important examples: First, it becomes possible to pretest instructional materials for appropriateness to students and for resulting gains in learning. Second, it becomes possible to provide the learner with reinforcement knowledge of results and immediate "feedback" assessments of his performances.
- Applications of empirical procedures for developing core courses of recorded instruction may increase the quality of stimulus materials and better ensure that performance criteria and instructional objectives are attained. However, they will also greatly increase demands put on professors for selecting, reproducing, and testing instructional materials.
- New technologies can eliminate the need for repeated lecturing and demonstrating before classes. Such work can be begun in the production stage and continued during the presentation-use stages of instruction.
- Properly produced instructional materials largely negate the professor, or his filmed or televised image, as the mediating agent of instruction. In the more

modern, improved formats (especially for college and university instruction) student interaction with instructional or stimulus materials is direct, continuous, and sequential.

- The transfer of work from the teacher to equipment systems and to technical specialists could enable college professors to engage in alternative activities that now are often neglected or which actually cannot be done in some institutions, such as (a) keeping informed of new developments in a content field; (b) revising, improving, and updating course materials; (c) observing systematically and attempting to understand student learning styles and activities; (d) revising materials for the best "fit" with student learning styles and activities; (e) keeping informed on the science and arts of instruction and learning; and (f) counseling and advising students individually or in small groups.
- Instructors and students will have different patterns of access to information. Developments in library technologies will both speed up and extend the range of library materials to which academic people can have access. Distributive technologies may make information available when and where needed, thus making possible a reduction of the movement of people in space. Users of libraries and other central stores of information may be dispersed over wide areas. Travel demands of extension workers can be reduced.

The following questions summarize the problems that relate to changing roles of professors and students as a result of the development and introduction of modern technologies into American colleges and universities: How can college and university faculties be led to accept the challenges of new technologies and encouraged to master the skills necessary for using them? What changing role expectancies for professors are specific consequences of the introduction of new technologies into colleges and universities? How and to what extent can students be retrained in "learning sets," learning skills, and learning performances so as to take advantage of new educational technologies? How can the distribution of responsibilities for accepting or rejecting, using or not using, advanced equipment and methodologies be assessed for the academic people in colleges and universities but especially for planners, managers of finances, budget makers, and top-level administrators?

II

CURRENT STATUS OF EARLIER STUDIES

AS PLANS were discussed (see Preface, page 1) for the 1967 restudy of the earlier *New Media in Higher Education*, the first question considered was that of developments since the 1963 publication in the 93 projects reported there. Accordingly, letters were addressed to authors of each article in that volume. A copy of the article as it appeared in 1963 was enclosed, and the author was asked, "(1) What is the present status of the practice in your institution? (Is it still operating? In what respects has its utilization been significantly expanded or diminished?) (2) Have other departments in your institution adopted similar techniques as a result of your experimentation?"

As responses began to come in, it quickly became apparent that the questions asked had been too simply phrased. A good number of the articles in the 1963 *New Media* had been descriptions of experiments that came to a conclusion, were reported, and were not continued in the same way, or were discontinued in favor of further study on related applications of media. Again, it became apparent that there is a high degree of mobility among workers in higher education who are familiar with any of the new media. The mere statistical report on the responses to the follow-up inquiry should be read with these two facts in mind. It is also notable that in all cases in which an answer was not received within 6 weeks, efforts were made to find out where the original author might now be working, and a second letter was addressed either to the original address or to the new address.

If "no response" is interpreted very strictly to mean that our efforts failed to elicit direct comment about the 1963 article, then it must be admitted that there were 19 articles about which no further word was submitted. Analysis of the articles and consideration of the institutions from which they came, however, make it clear that this most rigorous interpretation seriously understates the exceptional degree of cooperation the HEMS staff were accorded by media workers all over the nation. Only three institutions failed to respond in some way to our request for follow-up information, and two of these were large university campuses, in which experience shows that it is all too possible for letters to be lost or ignored, unless they are addressed personally and directly to a staff member who is presently on duty.

An additional six were reports of short-term experimental studies, several supported by National Defense Education Act funds, that had been completed and reported. The conclusions and insights resulting from the experiments had been made a part of the literature in the field, and the authors (we assume) felt justified in ignoring our standard duplicated request for information on the basis that they were involved in other more immediate activities. Ten authors were associated with these six experimental reports in the 1963 *New Media*; of the 10, only one was reported by his institution in 1967 as being associated with "innovations in instruction making use of educational technology including the new media of communication," in answer to the original canvass of 1,400 institutions of higher education in the United States. The editors conclude that even if these authors had responded, they would have added few comments on present status of the completed experiment or on its extension to other departments of the institution.

The remaining 10 articles in the "no response" category bear out the observation that failure to respond to the original inquiry rarely indicated a complete failure of the staff to communicate with the 1963 authors. In each of the 10 cases other communications have been received from the institution or from one of the authors of the 1963 articles, even though no specific comments were made about the earlier report. The reason for this lack of comment seems to be, in these instances, that the 1963 reports were initial and tentative descriptions of practices that have now become so much more sophisticated and so thoroughly conventional that workers preferred to comment on new developments in their institutions rather than rehash comments about earlier statements. Seven in this group of articles, for example, dealt with applications of tape recordings to fields other than speech and languages; one dealt with open-circuit instructional broadcasting; and two were descriptions of very early efforts in the introduction of multimedia systems to instruction.

These 10 articles, moreover, came from one nonuniversity institute, now reported to be "in inactive status," and from only five colleges and universities. Each of these five continues to be most active in the application of new media in instruction, and each is represented in the new reports that make up the major portion of the present volume.

In summary, although no specific observations can be reported about 19 of the 93 original articles from the 1963 *New Media*, it is fair to say that only 3 of these represent a failure of the follow-up procedure; 16 are not included in the specific comments that follow, but their omission does not indicate in any way a cessation of interest on the part of the 1963 authors or their institutions.

CLOSED-CIRCUIT TELEVISION

The section on Closed-Circuit Television in *New Media in Higher Education* (pages 33-62) included 24 reports of applications of this medium; most of them were concerned with live broadcasts. At that period, videotape recording was a comparatively recent development, and very expensive; only three of the articles mention the use of videotapes, and two of these give brief descriptions of their uses.

The major emphases of the reports were (a) on the use of closed-circuit television to multiply the instructor either in several rooms on campus or at remote campuses, and (b) on the use of the medium to permit students to observe techniques — in surgery, dentistry, counseling, and classroom teaching — where the presence of an observer or a class would introduce difficulties or distractions into the procedure being studied.

Reports received in answer to the HEMS inquiry justify several conclusions about the use of closed-circuit television in higher education:

- There has been a continued expansion of use of television on these campuses, as evidenced by such comments as, "The practice described as exploratory is now routine procedure," and "CCTV is now supported by a full-crew production studio and by provision for instructors to operate their own in-class camera-monitor enlargement of demonstrations."
- The wider use of videotape has resulted in the abandonment of some of the attempts to link institutions by microwave or by cable for TV transmission. It is educationally more rewarding to prepare tapes carefully and in advance for on-campus showing and to send either the tapes or copies of them to other campuses. In this way, convenient repetitions of showings at each site are facilitated, and the costs of long-distance broadcasting are avoided.
- Closed-circuit television has become an accepted member of the armory of instructional techniques so that a wholesome interest is discernible in the use of the medium to improve instruction, with somewhat less emphasis than was observed in 1963 on its contributions simply to economy in unit costs of instruction. It is evident from the developments in 1963 uses (as well as from the new reports presented later in this book) that closed-circuit television in combination with videotaped course presentations can bring new dimensions of concreteness and excitement to classroom instruction.

REGULAR COLLEGE CREDIT INSTRUCTION VIA TELEVISION

Nine reports were listed under this heading in the 1963 *New Media in Higher Education*. Of these, six were experimental studies, completed and reported. Four of the six authors did not respond to the HEMS letter of inquiry, as noted in the preceding discussion of "no response" articles; the other two did answer, to indicate only that their studies had been completed but that other interesting activities were going on on their campuses (reported later in this book). The other three reports indicate that the use of open-circuit commercial broadcasting for presentation of college credit courses has been successful and can be used effectively in other situations. Detailed descriptions of the present status of these earlier experiments and of the introduction of television for credit in other areas will be found among the new articles.

Certainly the experience of the Chicago TV College and the University of Southern California in this field indicates that there is a desire on the part of the viewing public for this kind of service. Difficulties seem to lie mainly in (a) the ability of the educational institution to defray the expenses of preparation and instruction of broadcast courses and (b) the opportunity to fit credit instruction into schedules of commercial stations, or even of educational stations. Providing these problems can be solved, the evidence confirms the conclusion that there is a market and a definite value to the student viewer for open-circuit creditworthy college classes.

FILMS

Twelve of the articles in the 1963 *New Media in Higher Education* described the use of films in instruction. Two told of the gathering of films of outtanding scientists or great teachers; two told of the niversity production of instructional films; five thers discussed the effectiveness of films in instruction in education, physics, graphics, and languages; wo told of the use of films to record research results or later analysis; and one described the use of ndoscopic film techniques in internal medicine and n surgery.

Three main conclusions may be drawn from the esponses of original authors to the HEMS inquiry:

- The use of films in classroom instruction is continuing and expanding; institutions that reported their practices in production and use of motion pictures are still actively and enthusiastically engaged in these activities, with due regard for applications in which the contribution or the ease or economy of film usage is superior to that of other media.
- The use of the brief cartridge Super 8 single-concept film has expanded very widely during the past 5 years. Only one article mentioned this application in the 1963 compilation; but the visits of the HEMS staff and articles received in 1967 indicate that the single-concept film is one of the most widely used of the self-instructional techniques; the author of one of the 1963 reports concludes in a letter, "We consider this to be one of the ground-breaking proj-

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ects in the field, and are currently involved in exploring uses of short, fragment films in education, fine arts, and mathematics."

- The videotape, with its potential for immediate playback and for erasing and reuse of tape, has replaced motion pictures in situations where immediate or early replay of the picture is important in instruction. The fact that each medium has its own advantages is underscored by the practice of transferring edited excerpts of videotapes to film, as reported in several of the newer articles.

LANGUAGE LABORATORIES

In 1963, the editors separated 11 articles into the two categories of "Language Laboratories" and "Listening Laboratories." A suggestion was included that "tape recorder listening stations are used increasingly to provide audio learning experiences for purposes other than language instruction." The extension of listening opportunities in subjects other than languages has proceeded apace since 1963; it is no longer appropriate to divide audio laboratories according to the subjects they serve, since the same sound reproduction equipment is commonly used for self-instruction in any field, and the class uses in languages are only adaptations of the techniques.

In 1963, *New Media in Education* described an early application of "the principles of telephony in the instrumentation of language laboratories." It was a prototype of the many random-access audiotape systems now in operation that permit the student to dial any available program from stations all over campus and in living quarters, to listen for as long as he likes, at any hour convenient to him, at the same time that large numbers of other students listen at their own terminals to the same program. Where one such report was submitted in 1963, the present survey attracted at least 41 listings of similar installations. In the judgment of the HEMS staff there are at least as many more such laboratories at present in operation or planned.

Two of the institutions that in 1963 reported the use of conventional telephone equipment in language instruction have now substituted random-access equipment for the earlier practice. Another college uses telephone lines to transmit taped information to small limited range FM transmitters in dormitories; students can use their own FM receivers to listen to any of four channels repeating language lessons every hour, for as much as 12 hours a day. In visits to campuses all over the nation, members of the HEMS staff found interest and enthusiasm about the economy and flexibility of similar uses of multichannel radio dissemination of instruction. It seems conservative to suggest that over the next 10 years this approach may expand as vigorously as the installation of random access to audiotapes has recently grown.

An additional development in prospect, not even mentioned in the articles included in the 1963 report, is the addition of videotape capability to the present audio instructional systems. Two or three colleges have installed the video screens in some of their study carrels and are able to transmit pictures on request; but so far as the HEMS staff has been able to determine, no college now provides random access to television programs in the same automatic fashion as audiotapes can be commanded by the student. This, too, is a predictable next step.

PROGRAMED LEARNING

Ten articles were included in the section on Programed Learning in the 1963 edition of *New Media in Higher Education*. They were concerned with the problems and achievements in development of programs in college instruction, whether presented by print or machine. Articles stressed difficulties involved in developing appropriate programmatic materials; several reported on comparative studies of learning by means of equipment-controlled programs, printed programs, and conventional classroom presentations. Two reports dealt with aspects of programed instruction that have been in the forefront of recent interest in application of new media to higher education instruction.

The first of these reports dealt with a computer-controlled teaching system, PLATO (Programed Logic for Automatic Teaching Operations), at the University of Illinois, Urbana. PLATO continues in use as an experimental system, with some applications to in-service teaching of students. New equipment has been installed in student stations, and new computer generations are being pressed into instructional use as rapidly as they become available. The flexibility of PLATO, as described in the later sections of this report, continues to improve. In addition, several other universities are experimenting intensively with computer-assisted programed learning, and a few provide regularly scheduled instruction via computer in as many as 15 to 30 courses a term. As in 1963, a limiting factor on the widespread use of computer-assisted instruction continues to be the scarcity of well developed and tested programs, but this lack is being worked on together with the experimentation in techniques. More than 190 institutions responded to the initial inquiry of the survey that they were using computers in some way in relation to instruction.

The second of the 1963 descriptions that has since seen widespread development is the multimedia instructional laboratory. In 1963 this facility was classified under the category of programed instruction because "preparation for a multimedia instructional laboratory presentation mobilizes the specialized talents of a considerable staff." Although the operation described in 1963 was not the only laboratory of its kind at that time, such installations were then comparatively few. In the present survey, in contrast, some 57 colleges and universities report the existence of classrooms equipped for display of instruction by a variety of media. Reports presented in the following chapters will indicate the potentials as well as the problems of these installations.

In relation to programed instruction as a category, developments since 1963 seem to justify several comments:

- Programed instruction is not now seen as a single method of instruction in a course; rather it is one of a combination of methods used by the teacher to free himself from the repetitious presentation of drill and informational material so that he may devote more of his time to interpersonal kinds of instruction.
- Programmatic materials are presented in a variety of ways — books, computers, tapes, and combinations — but the teaching machine seems to have given way to the computer as the favored method of presentation.
- The present stress in course development seems to be directed more toward a radical systems approach than to any partial emphasis on a single technique as the answer to problems of motivation or of individually prescribed instruction.

SELF-INSTRUCTIONAL LABORATORIES

Five articles in the 1963 *New Media in Higher Education* dealt with provisions for self-directed and paced instruction in the use of audiovisual equipment, in preparation for student teaching, in physical education, and in botany. The five examples included only three separate models of learning activity, each of which has since been extensively adopted. The interesting concept that audiovisual equipment may be used in a progressive program of self-instruction in the use of audiovisual equipment (an important skill for prospective teachers) has earned widespread acceptance. Many of the colleges visited during the HEMS survey demonstrated step-by-step programs that permit students to learn use of the slide projector from printed instructions and drawings; next to use the slide projector to learn the operation of the tape recorder; the tape recorder then helps them to learn to use the 16mm projector; and so on. This programed laboratory practice seems to enable students to complete their assignments at their own rate and convenience and allows the instructor to use class time for substantive instruction rather than in supervising practice.

The second model involved the use of films to enable student teachers to react to classroom situations and to permit physical education students to compare their own progress in skills with the performance of champion or professional athletes. The advent of videotape recorders has made possible the widespread application of this technique to many instructional situations where self-observation and self-criticism are desired. "Microteaching" is a technique in which a prospective teacher presents a brief lesson before a small class of pupils, then sees his performance immediately, and follows this session by a repetition of the same performance. The taping of speech classes, group therapy sessions, counseling interviews, or dramatic rehearsals, followed by immediate or delayed playback, obviates the necessity for much criticism by the instructor: the student himself can see, without opportunity for alibi, his successes and his shortcomings.

The third learning activity described in the earlier section on Self-Instruction Laboratories has also attained recognition and acceptance in a growing number of institutions. The Postlethwait model of self-instructional laboratory in sciences, for example, has been adopted in junior colleges, colleges, and universities in all parts of the country. A completely new article in the later section of this report describes these developments on the Purdue campus as well as in other colleges.

A frequent emphasis in discussions of university life during the past decade has been on the need for more active participation by the student in his own education. Each of the examples of self-instructional laboratories presented in the 1963 report has shown vigorous growth and extension; the opportunity is afforded many college students to take increasing charge of the pace and scheduling of their own education.

LARGE TRANSPARENCIES AND OVERHEAD PROJECTION

Four reports in the 1963 *New Media in Higher Education* described application of transparencies and overhead projection to instruction in English, engineering, physics, and dentistry. Four years later, each of the authors of these four articles reports that use of this technique has spread to more instructors in his own department and to other applications in instructional fields in his institution. Because of its low cost and ease of preparation of materials by the instructor himself, there is evidence that the overhead projector is the most widely used of all of the display equipment available. The 1967 survey shows that 177 institutions report use of transparencies in their classrooms; it seems probable that additional colleges use the technique but do not consider it to be "innovative."

VIDEOTAPES

Perhaps the editors should emphasize once more that the 1963 *New Media in Higher Education* was developed on the basis of limited scrutiny of the entire field of higher education and that no claim was made to comprehensive coverage of all uses of new media at that time. The 1967 survey, on the other hand, made a concerted and repeated effort to learn of new media activities in 1,400 institutions of higher education. A numerical comparison, therefore, is subject to some reservations based on the nature of the two populations. Still, in the consideration of videotape utilization, the development of convenient and low-cost videotape recording machines in the past few years seems to justify the conclusion that there has in fact been a marked increase in the number and types of uses of this medium.

A major section of the presentation of new articles in the later section of this report is concerned with videotapes. In relation to the developments since 1963, it is sufficient to indicate here that whereas two reports were included in the 1963 volume, 1967 responses were received from 112 institutions, indicating that videotapes are used in some way in instruction.

ADMINISTRATION OF NEW MEDIA IN HIGHER EDUCATION

One chapter in the 1963 *New Media in Higher Education* also was devoted to aspects of administration of new media. A research report on obstacles to optimum use of new media led off the chapter and was followed by six descriptions of institutional organization for audiovisual services to faculty, three descriptions of physical facilities designed to facilitate instruction using new media, and five miscellaneous articles dealing with faculty development policies and other practices. The simplest report on status of these articles is that each of the institutions that reported on specially designed buildings has now added other buildings similarly equipped; that audiovisual services have tended to become "instructional resources centers"; and that new and ingenious strategies have been devised to encourage faculty members to scrutinize the quality and relevance of their teaching and to accept the help of instructional resources centers in bringing their practices more into harmony with communication possibilities now at our disposal.

SUMMARY

This rather brief review of the present status of activities reported in 1963 was undertaken as one way of determining trends in instructional practices in higher education in 1967. The evidence reviewed indicates clearly that it is no longer true that college instruction is the most conservative aspect of American civilization. In a period of only 4 years, during which problems of rapid growth in numbers of institutions and in numbers of students have had to be accommodated, there is undeniable expansion in the thoughtful application of previously reported new media to instruction. No innovative practice of promise at that time is now reported to have been abandoned for reasons of cost or of faculty inertia; rather, there is evidence of careful evaluation of results of experimental instruction and of rapid development of more sophisticated and effective applications of practices that were at first adopted only tentatively and unpretentiously.

The remaining chapters of this report form an exciting and encouraging sequel to the promise that was extended by the earlier volume.

III

INSTRUCTIONAL TELEVISION

THROUGHOUT the *Higher Education Media Study* the focus of attention was on instructional uses of various educational media rather than on their utilization in general administration, student personnel programs, or research. This same rule applied to investigation of varieties of uses of television in colleges and universities, as discussed here. The comments that follow are thus concerned primarily with the contributions of television to teaching and learning in higher education.

When educators first thought of using television in instruction, they were often concerned with its special contributions in solving problems stemming from rising student enrollments and the relatively static supply of new doctoral degree holders, many of whom were being enticed into government and industrial service instead of going into college teaching. Under such circumstances television was seen primarily as a means of increasing efficiency by multiplying the professor's audience. Some educators also mentioned a special potentiality of the medium for multiplying the effectiveness of especially able professors by permitting them to teach hundreds or thousands at one time while other less distinguished professors served as discussion leaders with smaller groups in various remote locations.

Almost immediately after the first installation of educational TV facilities, however, it became quite apparent that the simple transmission of a "grey picture of a grey-haired scholar in a grey suit dispensing grey ideas" was an undesirable misuse of the medium. Comparison with some aspects of commercial television made it even more clear that instructional television was improperly exploited when it was used simply to broadcast a lecture. It seemed essential, then, to restudy the behavioral purposes of teaching, the techniques of instructional presentation, and the proper roles of visual and audio materials in conveying information and in building concepts. Perhaps if such fundamental replanning of course presentations could be achieved, television's role as information disseminator would be enhanced markedly. To the editors of this study, it seems that on many campuses educators have paused to regroup forces to attack the more fundamental problem of course rewriting, not only so that their own use of television might become more effective, but so that all sorts of classroom presentations might be revitalized in light of new insights about educational communication and learning.

The present pressing problem is still that of developing course materials that are worth televising, rather than in planning new and more complicated physical installations. This conclusion is reinforced by the study of many reports received from institutions describing their achievements and difficulties in the utilization of television. In addition to colleges that are now using closed-circuit television, videotape recorders, interinstitutional broadcasting, and open-circuit instruction for credit, there are fully as many institutions proceeding with plans to introduce one or more of these uses as rapidly as funds and construction of facilities will permit.*

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* Since the presence of the equipment seems to stir the inventiveness of faculty members, it is almost impossible to list the usages of television in neat categories. At each site where a TV capability has been installed, several kinds of instructional utilization are in operation or in advanced planning stages. The separate descriptions that follow in this report should be read with this fact of overlapping categories in mind.

USES OF TELEVISION IN HIGHER EDUCATION

The simplest use of television is as a substitute for "live" presentations in a large auditorium. One or two cameras are focused on the professor's area, either in a classroom or in a studio. Sometimes a class is with the professor as he lectures; sometimes he addresses himself solely to the camera. There is the additional option of sending the lecture live to any convenient number of remote receivers or of taping it for showings at several times and in any number of classrooms. Also, by means of tape, the professor may use television as his own stand-in when he himself must be absent from class, or he may use it as a "rerun" opportunity for students who have missed or wish to hear again an earlier presentation.

A second rather simple use of television may be made with the same equipment. In a large classroom equipped with monitors, or even with monitors in remote classrooms, it is possible to magnify realia or to broadcast microscopic demonstrations so that large numbers of students may view the single visual. This application is widely used in introductory science classes taught in large amphitheaters and in making surgical operations visible to medical classes.

A third example of minimal use of the potential of television in instruction is found in the simple microwave transmission of televised signals to receivers at other locations, such as those in a system of colleges where it is either not possible or not economically feasible to staff a given course, or where the specific contribution of some noted lecture-demonstrator is desired. The option of live or taped transmission is available in this as in other uses of the medium.

Although exchange of programs by means of videotape is entirely feasible, and programs to facilitate tape exchange have been instituted (notably the National Center for School and College Television at Indiana University), interinstitutional sharing of courses has not yet received extensive acceptance. Another development, seeming to gain wide acceptance from school districts but not by colleges and universities, has been the newly established instructional TV fixed service (2500 MHz) system, which would permit open-circuit telecasting but with a closed-circuit performance. The latter system of telecasting may in the future have value in large colleges and universities.

In using television for live transmission of lectures to a greater number of students in several locations, it seems almost essential that the entire course be presented on screen, whether or not tape is used, since the professor is not otherwise available at the several class locations. A more sophisticated development is possible if the major purpose of the use of television is to improve quality of instruction. Short segments of a course may be prepared and produced with great care for showing as part of a personally presented series of classes. In one of the institutions visited, for example, the professor had produced nine half-hour tapes to be used as part of a course. His practice was to introduce a tape during the first few minutes of the class hour, and to be on hand for questions and discussions at the end. By this means, he was sure that his demonstrations would be completed within time allowed and that they would go off without unexpected catastrophes, all without losing the human touch. While this kind of utilization does not solve the problem of numbers, it does indicate one way in which television assists professors in improving the quality of their presentations.

Some of the most interesting uses of television are those enabling professors to present and students to observe events that would be otherwise inaccessible or unobservable, or where the presence of observers would introduce distracting or contaminative elements into the event under study. Thus demonstrations of moving machinery, and emphasis on safety rules in its use, can be presented in engineering or industrial arts by means of closed-circuit television. Students can observe counseling interviews or psychiatric treatments without obtruding their presence on the clients; tapes of these same events permit the practitioner or intern to observe his own performance, or perhaps to analyze at leisure the responses of a client. In teacher training, too, large numbers of college students can observe grade school classrooms or nursery schools while at the same time listening to their instructor's comments on procedures — all with minimum interference in the ongoing classroom work. In medical, dental, and nursing classes, particularly, television has become an invaluable aid to clinical instruction. Observation of procedures heretofore limited to only one or two student observers at a time can now be made available at close range, in full color, and at great magnification — to entire classes. In addition, videotapes of the same procedures permit repeated observation and criticism of certain classical procedures of medical practice. At any point in instruction where close and repeated observation of an event is desired, television can provide that opportunity either for classes or for individuals, either for the professor or for the student.

A self-contained classroom TV system — camera, videotape recorder, and monitor — offers exciting possibilities for teaching all sorts of skills. As an example, in such diverse fields as student teaching and golf, taping a practice session allows the learner to see, criticize, repeat, and improve his own performance. There is little opportunity for difference of opinion between learner and teacher when immediate playback portrays the actual occurrences. The practice of microteaching — a short segment of practice teaching with a small class of pupils, recorded on videotape — has been used to improve the quality and efficiency of preparing future teachers for their full-scale in-class student teaching.

Among promising frontier potentials of TV instruction, at the end of 1966, was the development of true team-teaching approaches, combining the talents of the scientist, the graphics technician, the imaginative producer-director, perhaps the actor, with those of an n-classroom or seminar room instructor, to ensure hat every avenue of communication is used in afford- ng every student a full opportunity to learn to his wn highest potential. Statewide or regional dissemi- ation of such instruction has been planned and in ome states tried experimentally; it is hoped that, ventually, all faculty members within any system an be linked in a cooperative closed-circuit network n order that every topic in a course may be superbly aught by the most competent professor in the sys- em to every student in that discipline. That possi- bility exists at present; perhaps it will be reality in he very near future.

Open-circuit TV courses for college credit are a present reality; students have completed work for diplomas by means of broadcast courses. The accomplishments of the few colleges that have tried this plan make it plain that important gains in education of full-time workers and shut-ins and in post-graduate education of professionals are eminently feasible by this means. It is also possible that selected courses may be attended at home by campus-enrolled students, thereby permitting economies in use of classroom facilities.

Self-observation by means of videotape is another exciting practice applied in speech courses, in training of student teachers and counselors, and in development of motor skills in physical education. The gift "to see ourselves as others see us" has been granted by television. The capture of historical events for later classroom use, the delivery of live cultural events on campus into the living quarters of students, and access at individual carrels to videotapes are only a few of the future possibilities already being tried in a few institutions.

CASE DESCRIPTIONS

Videotape Use in Training Secondary School Teachers
Carleton College, Northfield, Minnesota
Willis D. Weatherford

The Associated Colleges of the Midwest Videotape Project was initiated in June 1964 under a $160,000 Kettering Foundation grant. Purposes of the pilot project were (a) to determine the feasibility of using portable, relatively low-cost TV equipment to record unrehearsed, spontaneous teaching-learning activities in classrooms exhibiting a variety of lighting and acoustical conditions; (b) to produce a limited number of edited videotapes for use in professional education courses; and (c) if time and resources permitted, to experiment with the use of videotapes in appraising and improving the performance of student teachers.

The pilot project was completed in the fall of 1965 at which time the Kettering Foundation contributed another $100,000 to support the continued production of videotapes.

Since its inception, this project has recorded approximately 300 hours of classroom activity. Some tapes illustrate classes of slow learners and gifted learners, sometimes taught by the same teacher to demonstrate variations in approach; some illustrate the effects of teacher attitude on student responses. Others serve to illustrate various teaching-learning methods such as discussion, review, supervised study, oral reports, and the inquiry approach to teaching. Discipline problems and differing approaches to classroom control also are represented.

Classes at Carleton and St. Olaf Colleges have been testing grounds of the effectiveness of tapes in improving professional education offerings. Subjective evaluations obtained from instructors and students have been very encouraging, the only negative comment from students being that the edited segments of classes were often too brief.

This was perhaps the most important result of the tryout phase. Students tended to be frustrated by the short, illustrative "clips" which had originally been envisioned. From their comments, it appears that it is the continuity of action on tapes which should be preserved rather than fragmenting tapes to preserve the continuity of a course outline.

Preserving the continuity of tapes makes it possible to use them to provide a unique and highly profitable opportunity for prospective teachers; that is, the opportunity to "teach along" with the regular teacher. Since the videotape can be stopped, reversed, and started at will, students can, in effect, be placed in many decision-making situations.

In addition to producing videotapes of experienced teachers, the project also has made tapes of about 70 student teachers, most of whom have been participants in the ACM Urban Semester Program. These tapes were viewed and discussed by the student teacher and his supervisors as soon after the taped performance as possible. It can be said that most student teachers profit greatly from the kind of self-evaluation viewing one's own tape permits. This reaction is consistent with those obtained from experienced teachers who have viewed their tapes.

Future plans for the project include continued production of videotapes and a fund-raising to add a research component to present activities and to distribute the tapes produced to educational institutions outside the ACM.

Classroom Videotaped Episodes as Observational Tools
Central Washington State College, Ellensburg
Charles Vlcek

One of the problems facing many colleges preparing teachers today is that of providing opportunities for students to observe classrooms. Closed-circuit television was installed in 1957 to accommodate a greater number of students with fewer interruptions to the public school program. However, while this use of television lowered the number of live observations required, televised observations still left many problems unsolved:

- There were schedule differences between public schools and college.

- Seasonal activities in the public schools were not available during all college quarters.
- Fifty minutes would elapse during many periods with only 10 or 20 minutes of the desired activity taking place.
- Increasing college enrollments again flooded the public schools with student observers.

In an attempt to solve these problems, videotape recorders were purchased and placed into operation during the winter of 1966. Present facilities used during an observation include two Kintel cameras — a mobile camera at the front of the room concentrating on student activities, and a second camera mounted on a cart which follows teacher activity. The cart contains a wave form monitor, two Sony 5-inch video monitors, camera controls, and a video coax-switch. A standard low projection cart holds a videotape recorder, Sony Model PV-120/U. One microphone, Shure Model 55S, is suspended by a wire from the ceiling approximately 8 feet from the floor, one third the distance from the front of the room.

Observations are scheduled only after detailed planning by a college professor. He first identifies the objectives which he hopes an observation will fulfill, i.e., student and teacher activities and behaviors. He then seeks a prospective teacher through the closed-circuit coordinator's office. The TV coordinator, through public school principals, locates a teacher who is teaching the desired subject in the desired grade using the desired pedagogy and at the approximate time desired. The college professor must then arrange for a conference with this teacher one week prior to taping.

During the afternoon prior to observation the equipment is transported to the public school classroom, assembled, and tested. The professor directs two student cameramen during observation and does his own switching from camera to camera. Prior to observation he may tape an interview with the teacher asking questions in regard to preparation and what is going to occur during the lesson. He or members of his class may interview the teacher after observation also.

After observation the college professor and the teacher preview the videotape indicating the sections which the professor desires to save for later playback in his class. These are then edited and dubbed to another tape. In most cases this procedure shortens the playback time from its original length of 40 or 50 minutes to perhaps 10 to 30 minutes on the playback, thus saving valuable class time while still fulfilling the objectives. Two and three episodes are dubbed onto one tape and carefully cataloged for retrieval.

The results of our videotape program have been rewarding:

- There are fewer interruptions to the public schools due to multiple playbacks during later quarters.
- Less professor time is required due to multiple playbacks and sharing with other professors during following quarters.
- Seasonal public school activities are available for use during all college quarters.
- Public school teachers appear to improve their teaching through self-critique of videotapes.
- Videotaped episodes can be used to improve principal and supervisor teacher evaluation skills.

A Junior College Program on Open-Circuit Television
Chicago City College's TV College, Chicago, Illinois
James J. Zigerell

TV College, the open-circuit TV extension of the Chicago City College broadcasting via WTTW-Channel 11, is now in its eleventh year of service. For the last few years, TV College has been on the air a total of 25 or 26 broadcast hours a week, presenting nine courses — four of which are live — during fall and winter terms. More than 70 different courses have already been offered.

Since 1956 almost 100,000 individuals have enrolled in about 150 courses on a credit or noncredit basis. About 140 of these students completed requirements for the associate in arts certificate on television. Another 1,300 completed a significant portion — that is, about one semester — of the junior college work on television. TV College also enrolls chronically ill and physically handicapped students, as well as some confined to penal institutions. Audience surveys show that hundreds of thousands of occasional viewers tune in to TV College telecasts.

Though the primary objective is to present full-credit junior college programs to viewers at home, swelling campus enrollments now require that TV courses be made available to regular student viewing in classrooms, should academic departments request them. The numbers enrolled in on-campus TV courses have jumped over the past 3 years, with a record high of approximately 1,800 on-campus students enrolled during fall 1964. However, lack of adequate viewing facilities, lukewarm acceptance by departments, inadequate departmental planning for TV-in-class use, and the enrollment of probationary and academically weak students have hampered the development of on-campus use.

The performance of the home TV student — typically a woman in her thirties with an eye on a career — has always been high. Continuing studies show her — or his — performance to be as good as or better than that of the on-campus student of comparable ability and maturity. About 75 percent of the home viewers who enroll for credit complete their courses. About 40 percent express an interest in teaching as a career. As a result, certain courses have been presented in cooperation with Illinois Teachers College.

With only two weekly open-circuit telecasts, teenaged students watching on campus cannot, as a rule, match the performance of home viewers over age 20.

To perform as well, these students require at least an hour each week of supplemental in-class instruction. The follow-up, to be effective, must be conducted by an experienced teacher with a constructive attitude toward TV instruction.

Studies of student performance continue, with current interest revolving about improving the performance of the teen-age student taking courses on campus or at home. The quality of course offerings, which are still designed primarily for the highly motivated home viewer, will be preserved. Therefore, departments using television on campus will be urged to schedule two follow-up discussions per week whenever feasible.

Within the last year courses recorded on videotape have been improved, with attention given to both production and instructional quality. TV teachers have been awarded additional released time to edit and revise their recorded series, study guides, and other associated study materials; some have been given reduced teaching loads to produce self-scoring exercises, based on programed learning principles, for use with their recorded courses.

In August 1966 the governing board of the Junior College and the TV teachers involved approved a trial release of recorded telecourses to the Great Plains Instructional Television Library of Lincoln, Nebraska. The Library has agreed to duplicate and distribute lessons to bona fide college-level institutions elsewhere. Neither TV College nor Great Plains will realize any profit. Users will be asked only to defray costs incurred in duplicating and processing. At this writing, Stephens College of Columbia, Missouri, has contracted to use a TV College course in philosophy of education during 1967.

TV College's plans for the future include seeking funds from federal or private sources to support special projects in the Chicago area: services to the gifted, the culturally disadvantaged, municipal and state employees, and those in need of job retraining and rehabilitation. Budget permitting, selected courses will be pretaped with a view to developing research designs to study the effects of production techniques on learning.

Finally, perhaps an attempt can be made at intercity cooperation. Chicago's TV College is eager to collaborate with New York or other large cities in the development of courses that meet pressing urban needs.

Use of Commercial TV Stations for Educational TV Classes

College of Great Falls, Great Falls, Montana

Patrick E. Lee

In the 10-year period from 1956 to 1966, the College of Great Falls has conducted over 30 regular courses, offered for full college credit, using facilities and time made available at no charge by the two commercial television stations in Great Falls, Montana. The classes are available to all viewers in the vast north central Montana area served by the two local TV stations — an area covering about one third of this large state and about the same percentage of its population. In addition, the courses are open to students who wish to take them for college credit, as well as to individuals of all ages who wish to enroll for credit but are not engaged in degree programs at the College.

Classes consist of lectures and demonstrations. Both writing and reading assignments are given. Written assignments are mailed to the instructor, read and graded, and returned to the student viewer. Tests are given either by mail or on the campus.

Classes conducted on television are listed in the regular semester bulletin with other classroom and laboratory courses. All are regular courses from the college catalog. In recent semesters, because of the popularity of the subjects and the availability of instructors, most courses have been in the fields of history and political science. But, over the 10-year period, the College has also used educational television to teach a two-semester course in elementary German, introductory courses in physical sciences and the visual arts, creative dramatics, modern chemistry and contemporary mathematics, and a variety of courses in English and Scottish literature.

A course in the history and geography of Canada, offered a few years ago, won editorial praise in Montana newspapers as a major contribution to American-Canadian relations, a subject quite dear to Montanans, whose state borders on three Canadian provinces and who feel a special kinship to their Canadian neighbors.

At present, classes are telecast only from 6 to 7 a.m. on Saturdays. Enrollments vary, with as many as 100 students enrolled for credit at some periods. Registration for the first semester of 1966-67, when the TV course was a political science class on American Relations with Asia, was 32.

Visual aids have been used on the televised courses whenever possible. Maps and charts, for example, are ideal for classes in history, geography, and political science. Simple demonstrations have been appropriate for classes in physical sciences and visual arts. The ability of the TV camera to take in an entire studio or to switch to a close-up of director and student in a class in creative dramatics contributed greatly to a workshop-type class in drama.

Letters from viewers not enrolled for credit reveal both a deep loyalty to televised classes and widespread interest in their content, no matter what the academic discipline. Nonstudent viewers have come to regard the teachers who appear most frequently as personal friends. The telecast classes have helped create a closer bond between the College and the surrounding community. They have provided information and pleasure for viewers, and they have enabled a great number of people to earn college credits in fields of interest and importance to them.

Television at a Medical Center

Duke University, Durham, North Carolina

Sam A. Agnello

The central TV facility at Duke University Medical Center is a subsection of the Division of Audiovisual Education. The other two subsections of the unit are Medical Art and Medical Photography. Audiovisual education as a whole is administratively responsible to the dean of the Duke University School of Medicine.

The TV control center is capable of interdigitation of all audio and video signals originating from TV cameras, a motion picture-slide-opaque pickup device, and videotape recorders. Studio and mobile cameras, monitors, and wide screen TV projector may be used in 25 specific locations on the cabled system throughout the Medical Center. These locations include all major classrooms, student laboratories, and conference rooms. With the use of extension cables, other locations may be reached.

All academic departments of the School of Medicine and the School of Nursing utilize television in teaching. Very rarely, however, have complete TV productions been used as the one medium through which instruction is carried. During the course of the past several years, the number of videotape recordings produced and played back has risen to the extent that at present about 80 percent of all TV utilization is by videotape. Individual tapes range in length from 4½ to 50 minutes. Subject matter is cross-disciplinary and contains special dissections, demonstrations of intricate and relatively inaccessible models, demonstrations of physiological phenomena, and clinical case presentations including symptomatology display. Other recordings appropriate to psychiatry are edited versions of psychotherapeutic interviews of the same patient over an extended period.

Television is used at all levels — with undergraduate medical students, house staff, postgraduate medical practitioners, and nursing and paramedical students. Graduate students and junior faculty can record lectures and other demonstration-type lesson sessions and review their own performances. Medical students and others can also request playbacks of videotaped material for small-group review. Department of Psychiatry house officers, as practicing therapists, use videotaped psychotherapeutic interviews in their learning.

Television is also used in other patient care situations. To obviate the need for repetitive injections of radio-opaque dye and to make possible immediate restudy, the cardiovascular laboratory has added a videotape capability. Here the visual recording is made and replayed ad lib to enable the physician to make proper judgments. Before installation of a videotape facility, the radiologic procedure had to be repeated, with consequent higher radiation levels. Delays due to the processing of cine film are now no longer an obstacle to early diagnosis since cinematographic and videotape recordings are made simultaneously.

The medical outpatient clinic is equipped with a TV camera in each of three patient examination rooms where videotapes are made of patient interviews and examinations for later playback. Live transmissions from these rooms are also possible. In this medical diagnostic treatment situation the single interview-examination makes it unnecessary for more than one member of a health team to be with the patient and gives all of its members an identical patient experience. The cardiac care unit, for example, uses television to provide immediate attention for its patients. TV cameras are located in each room, and pictures are transmitted to monitors in the nursing station. Other patient care activities involve uses of television to cover various areas during emergencies. The Medical Center, for example, has a plan which can be instituted for any major disaster. Cameras situated at strategic points relay visual information to Disaster Central Control. Spotters located at various TV points collect and relay information audibly to Television Control. This information is then placed on cards and superimposed over the appropriate TV visualization.

A continuing evaluation of the uses of television and the development of further uses of television are goals of the central TV facility, using both objective and subjective records.

Research and demonstration models also have been conducted with student examinations (quizzes).* Another research project involves the use of a double recording technique. A patient interview is recorded on one videotape recorder, and, after an appropriate pause, this recording is played back. The patient sees himself, and a second videotape recording is made of him as he watches. His pulse rate is simultaneously recorded by telemetry during both sessions.**

Plans are now being made to use television for continuing medical education and for linking community hospitals in North Carolina to the three medical schools for educational purposes. Other schools and departments at Duke University are planning utilization of television in their educational endeavors.

Surgical Applications of TV Magnification

Hahnemann Medical College and Hospital
Philadelphia, Pennsylvania

J. L. Osterholm and Jack Pyneson

Many medical centers use closed-circuit television during surgery for teaching. The medium is ideal for demonstrating difficult or unusual cases to a much

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* These research reports have been published under the authorship of J. E. Markee, S. A. Agnello, and F. D. McFalls, "Closed-Circuit Television for Examinations in Anatomy" (*Med. & Biol. Illust.* 12:19; 1961); "Examinations in Anatomy: Use of Video Tape Recordings" (*J. Med. Educ.* 40:214; 1965); "Learning Anatomy from Videotaped Versus Live Television: Student Achievement" (Abstract, *J. Med. Educ.* 40:900; 1965).

** This investigation is reported in the April 1965 issue of *Health Sciences TV Bulletin* under the authorship of Adriaan Verwoerdt, John B. Nowlin, and Sam A. Agnello and is entitled "A Technique for Studying Effects of Self-Confrontation in Cardiac Patients."

Photo by Charles H. Stamp

Full utilization of television for instruction in higher education requires high initial outlay for studio facilities and equipment. (Illinois Teachers College, Chicago North)

larger audience than could possibly attend the operation. However, television has been little used by the surgeon to direct his instruments in a more precise manner in deep or remote body areas.

In the course of surgical procedures, especially those deep in the head, the surgeon often has two major frustrations. First and foremost, his field of vision is limited by exposure, lighting, and size of structures. Second, it may be necessary for the surgeon to move aside to allow his assistant, or others in training, a fleeting glimpse of the definitive manipulations. Since only one person can physically view the field, let that eye be the TV camera, to provide optical magnification and give the operator and spectators a superb uninterrupted view of the entire procedure.

The surgeon's monitor is placed directly behind and slightly higher than the overhead instrument table. Separate monitors are installed outside the operating room. The camera must be sufficiently removed from the field to allow free surgical access without camera interference or fear of contamination.

Depth of instrument penetration is judged by clarity of focus. Since the plane of clear focus is only a few millimeters, gentle insertion of instruments, permitting them to come into sharp monitor focus, avoids overshooting and gives the surgeon the necessary third dimension.

This technique provides superior visualization of neurosurgical fields. At first consideration, operating indirectly while watching a TV monitor appears somewhat frightening. However, if the image is correctly oriented without mirror image or up-and-down reversal, one can master the most delicate maneuver in a one- or two-hour laboratory practice session.

TV magnification may be used for any surgery and has a great advantage when structures are small or visualization is difficult. As a teaching aid, surgery by television is unsurpassed. An entirely new dimension is added, enabling the student to see procedures previously seen only by the surgeon and perhaps the first assistant. Operating room personnel, students, residents, and referring physicians have obtained better understanding of the surgical procedures and have shown great enthusiasm for the field of neurosurgery since inception of this technique.

Instructional Television System in Use

Junior College of Broward County, Fort Lauderdale, Florida

George H. Voegel

The Junior College of Broward County is a part of the South Florida Education Center — an educational park or plaza concept whose main educational attraction at present is the Nova High School. Under construction on the corner of this park is a large TV studio complex to serve the entire Broward County with 2500 MHz ITV.

In this ITV center will be offices, a graphic arts production area, master control, and studio control rooms adjacent to two large studios. Also, a resources area will house references and materials related to the TV programs and provide a dozen or more office/work spaces for producers, writers, and TV teachers. Two broadcast-type videotape recorders and two film chains will probably be doubled in the next fiscal year to increase the capability to four recorded and one live transmission outputs, even though the center will not immediately have that many channels for transmitting programs. All equipment (except cameras and VTR's) will be color compatible, although initial programs will be black and white. It is anticipated that several years from now the Center will shift to color TV programing.

The Junior College, with the help of a higher education Title VI-B grant, is implementing a unique closed-circuit TV distribution system which is to be linked to this ITV center. A multichannel cable will be laid underground from the ITV building to a somewhat central location on campus, namely the library. In this building will be located a switching panel, a 16mm film chain, two slant track VTR's and an RF (11-channel) distribution wiring system from this site to all buildings on campus. Several camera outlets will be installed in the appropriate buildings in order to send a quality signal back to the center for recording there. Each classroom having a TV monitor will have the appropriate jacks for closed-circuit quality cameras for live in-class demonstrations and brief presentations. Portable videotape recording of such in-class sessions will be achieved by two portable completely equipped VTR units, and two other VTR's with cameras also will be available. They, too, will be able to jack into the monitors for recording the presentations.

Staff members in the paraprofessional and technical courses are making plans to use demonstration and object magnification-type TV techniques for such courses as nursing, medical assistance, and electronics. Utilization of television for the university parallel program (students enrolled in this program complete their junior and senior years at other institutions) will be for supplementary purposes and not as the major method of instruction. It is anticipated that continuous showings of film materials on film chains via the RF wiring distribution system will enable students to view these presentations outside of classroom time. There will be no large instructional room on campus other than a lecture hall with a seating capacity of about 250. It is also planned to do some television programing for the new Hospitality Center (student union) as an adjunct to and enrichment for the regular academic program.

The faculty will then have the options to —

- Use films via the film chains at either the ITV center or college switching location.
- Use 2-inch quadruplex videotaped materials from external sources and played through the ITV center.
- Use 1-inch slant track videotape materials from external sources.
- Record on videotape using either broadcast or closed-circuit quality equipment.
- Produce TV demonstrations, presentations, and productions either at the ITV center or in their classrooms.

Plans are being made for a 19,000-square-foot Learning Resource Center which will be attached to the library; it will have a small TV studio and additional facilities for electronic transmission and distribution.

The Psychological Laboratories at Lafayette College

Easton, Pennsylvania

J. Marshall Brown

The new facilities in the Department of Psychology at Lafayette College are designed to provide a different approach to experimental science.

The main laboratory facility for the Department of Psychology includes a large room with tables and chairs for students seated in typical classroom fashion. This room is surrounded by 14 cubicles and a master control room. In addition there are three remote cubicles not directly entered from the large room. Each cubicle is connected to the master control room with a 54-cable conductor plus audio and visual communication. Visual communication is from the master console to the monitors in each cubicle while audio communication is two-way.

Experimental information can be presented on either of two cameras, and by a special TV switcher the input from either of the cameras may be sent to any monitor. There is automatic impedance matching so that any one monitor can be turned on or off at any one time. This control is in the master control room. Thus it is possible to present a visual stimulus to any one or combination of cubicles while a second visual stimulus goes to other cubicles. With a split-second switching the visual stimuli to various cubicles can be varied or reversed.

The video communication system also allows for remote location of cameras and use of the camera and monitor system in picking up information from various other locations in the building, including every cubicle. Thus the equipment may be used for demonstration purposes or for specialized video and audio communication.

Ultimately each cubicle will be provided with suitable power and equipment to perform many individual experiments, particularly with human and animal subjects in learning and perceptual experiments. At the master console there are counters and recorders to pick up information that is created and recorded in any one cubicle, or information may be summarized at the master console. Thus group data may be collected and by means of television presented to the subjects immediately. The master console is also equipped with two stereo amplifiers, a turntable and a tape deck, as well as standard audio communication equipment. There are also programing equipment, film-driven timers, white-noise generators, etc., located in the master control room.

Laboratory equipment is cut to a minimum since one or two pieces of equipment can be made available for use by as many students as needed in any one or more cubicles rather than having 14 sets of equipment, one to each cubicle.

As the intercommunication system is completed, communication will allow for audio between the control room and any one remote station, or among remote stations at will, controlled by a master patch panel in the console. A new approach to patching has been designed so that rapid switching from any combinations of cubicles can be accomplished for all audio or for other connections made at the master console.

Two unique items in the system are the TV switcher and the master patch panel. The TV switcher with matched impedances allows for the aforementioned rapid switching from one camera to another into any or all monitors. The master patch panel is wired in such a manner that one function can be sent out to any combination of remote stations by simply inserting a pin in a hole, or a patch board may be plugged in to rapidly change large numbers of preprogramed functions.

So far the experimental equipment generally has proven valuable in demonstrating the use of equipment over the video and audio communication networks. Some experiments have been preprogramed. There has been some use of experimental procedures on the video system, such as presenting visual stimuli for perceptual tasks. In the future there will be much more use of the equipment as it is completely installed and ready for full functioning.

Campus-Wide Utilization of Television
Monroe Community College, Rochester, New York
ugene Edwards

Monroe Community College features a 4,000-student campus that has been especially designed to utilize all of the new media in every classroom, lecture hall, and laboratory. The campus will be serviced by an AV-TV Center that is one of the most extensive and comprehensive anywhere in a junior college. The AV complex, known as the Department of Instructional Services, is a 24-room, 12,500-square-foot center devoted to the production of all types of media including closed-circuit TV programs, slides and films, videotapes, audio recordings, and self-instructional media. Included are two large TV studios and a central electronic distribution center to receive and send audio signals, telelectures, 12-channel RF, and also nine separate video lines of TV signals. The complex includes a center for dial-access equipment, remote audio and video recording, and 2500 MHz intercollege TV signals.

There are seven fully automated lecture halls where the instructor can control lighting, sound, television and motion picture, filmstrip, slide and overhead projectors. Images are projected on 8′ x 24′ screens. Two of these lecture halls seat 120 students each, four seat 240 each, and one seats 600. There is also a hall seating 50 in the Audiovisual Center which is equipped the same way as the others and is used in departmental in-service training sessions.

A special roll-about TV studio unit was created for the science departments and features two camera inputs, special effects, rear screen projection, and videotaping in a roll-about console complete with EIA sync, camera control units and oscilloscope, a camera on a pedestal, and a studio view finder camera on a tripod and dolly. Both of these cameras are 10 MHz bandwidth, 800-line broadcast quality units.

Language laboratories are both conventional and "audio notebook" types. The business labs are equipped with the secretary's version of the audio notebook which is fed into three channels of FM for simultaneous transmission to students' headsets.

A fine arts auditorium has all of its controls in a projection-type booth where lighting, sound, and recording can be controlled. There are provisions for TV pickup at four points in the auditorium for recording and playback of music and drama.

The Music Department is using an Ampex video trainer daily in various music education activities. It is used primarily to record and critique student performances.

The Nursing Department has a 24-camera automatic sequencing TV system located in Rochester General Hospital which monitors activities and performances of up to 24 nursing students at a time. These performances can be videotaped by the instructor and played back to students.

A 2500 MHz TV system will permit Monroe Community College and three other colleges to broadcast and exchange tapes and college TV courses in several subjects.

Televised Instruction for Higher Education
Nebraska Educational TV Council for Higher Education, Inc.; KUON-TV, Lincoln
M. Scheffel Pierce

Every institution of higher education in Nebraska joined in the formation of a corporate structure for utilization of televised instruction, starting in October 1966.

The first series of broadcasts was intended to orient faculties. Representatives of several of the 24 member institutions presented sample lessons in a variety of academic disciplines, each intended to illustrate a specific facet of televised instruction. In addition to local productions, videotapes and kinescopes distributed by the Great Plains Regional Instructional Television Library were used for several of the sample lessons.

At the end of the first, or "orientation," series, the decision was made to offer two courses for credit by television beginning in February 1967. Students were regularly enrolled at one of the 24 member colleges and received their credit from that institution. In most cases the students met in class sessions to receive the televised instruction. Each of the junior colleges, colleges, and universities exercised its own judgment concerning credit, supplementation, and evaluation; in fact, each of them exercised the option to use or not use the televised courses, and if the decision was to utilize the course it could be used for one, some, or all sections of that course.

The Nebraska ETV network has its principal production center in Lincoln on the University of Nebraska campus. A second production center is located in Omaha on the campus of the Municipal University of Omaha and can also "feed" the entire network live or videotaped program materials.

The Nebraska Educational Television Council for Higher Education (NETCHE) is chartered by the presidents of each of the colleges. Major direction of the organization is by a nine-member Board of Directors. Detailed planning is the product of a "Planning Board" with representatives of each institution; the Board provides a channel of communication between all institutions and the Board of Directors at all times. Members of the Planning Board are appointed by the presidents and, in most cases, are either deans of administration or of instruction.

Initially NETCHE was financed by a combination of a uniform fee for each institution with an added fee based on enrollment. Each institution also was asked to cover any instructional costs for participation of its faculty members in the orientation series of programs.

One other function of NETCHE is the support of local institutions in the development of closed-circuit ITV systems. It has established certain standards as guides for Nebraska colleges in their planning.

A weekly newsletter is distributed to all faculty members in Nebraska colleges and universities to assist in coordination of local planning and network programs for higher education ITV.

The Instructional TV Program at Oregon State University

Oregon State University, Corvallis

Harold Livingston

Culminating 10 years of intensive experimentation with uses of television for a variety of instructional purposes, Oregon State University now has an integrated program of televised courses and other videotaping services in cooperation with the Instructional Resources and Materials Center, the Computer Center, and the two Self-Learning Centers. Three major courses in general biology, general psychology, and general hygiene have been developed over a period of 4 years involving large-scale research comparisons of the effectiveness of televised presentations in comparison to traditional methods of instruction. The general biology and general psychology courses involve two TV lectures per week with one period of small-group recitation. The general hygiene course is presented entirely by television and is broadcast over the state-owned TV network to students at Oregon College of Education and Eastern Oregon College. All courses are videotaped to ensure quality control, with provision to update the courses each year.

An experimental course in finite mathematics involves three televised lectures per week and one period of small-group recitation. Each televised lecture is simultaneously videotaped and audiotaped, with slides made of the significant visual materials used for each lecture. The Forestry and School of Education Self-Learning Centers coordinate the audiotapes and the slide materials into audiovisual units to be made available to students of the course for individual review at the Centers.

The Closed-Circuit TV Center houses a fully equipped production studio with three videotape recorders and seven viewing rooms designed for optimum viewing, and with a separate audio system using four small speakers at strategic locations in each room. Each room seats 32 students with one 23-inch monitor for each 16-student station. These rooms are scheduled 32 hours per week with provision to transmit two courses per hour into different rooms for maximum flexibility in scheduling. More than 7,000 students will take one or more televised courses this year.

The TV Center now has been connected to viewing rooms in all campus residence halls, and, in cooperation with the local closed-circuit cable company, Channel 5 has been given to the University for use in reaching the community. Students living in residence halls and in Corvallis homes hooked to the community cable service may now register for off-campus viewing of televised portions of major courses coming to the campus only for the small-group recitation sections. This development will be carefully researched to ensure no dilution of instruction.

Two special services have had excellent response in addition to the program of televised courses. A service launched in the spring of 1964 enables all staff members to videotape a lecture with immediate playback for self-evaluation. It has been used by approximately 300 instructors, who deliver their lecture in privacy or bring a class to the studio. Another service involves the ultimate goal of having every teacher trainee in the School of Education present one or more lessons on videotape prior to practice teaching for self-study and peer critique. Nine methods classes now use the TV Center for this purpose, involving more than 100 teacher trainees. Arrangements also are being made with school districts in Oregon having videotape equipment to record practice teachers at the schools where trainees are teaching, and these tapes will then be studied later by trainees after returning to the campus.

With the aid of a federal grant, the Department of Speech TV studio will be linked to the closed-circuit TV facility to provide an additional studio for originating certain types of programs on the community cable system. In addition, the Speech Department will use television and videotape in speech courses. An experimental study of videotaping laboratory work in the fundamentals of speech course as compared to traditional instruction was completed in 1964 with results favoring the use of videotape feedback.

The Closed-Circuit TV Center also has experimented with interchange of specialized lecture-demonstrations with other institutions, and this tape interchange is on the increase. There are now 40 specialized tapes made for 14 different departments which are scheduled regularly for studio viewing. The videotape library also includes certain role-playing tapes for training of counselors. After two years of using videotape with role-playing in counselor training, special taping facilities for this purpose are now installed in the School of Education.

Demands for experimentation with new courses and other services involving television far exceed present facilities and staff. The Television Committee, which is responsible for the instructional program, is highly selective in determining which proposals from various schools on campus show most promise in meeting the felt needs of departments involved, and also insists on the activation of a continuing program of evaluation for any new course or special service involving TV facilities. Telelecture is becoming increasingly popular on campus for use with extension courses.

With the Computer Center, the Instructional Resources and Materials Center, and the Closed-Circuit TV Center all housed in one building and working closely together on problems of instructional improvement, several exciting projects are under way in cooperation with our Self-Learning Centers that may have significant effects on teaching methods to be employed in the future on this campus.

The Many Faces of ITV at Purdue University

Purdue University, Lafayette, Indiana
James S. Miles

The Purdue University Television Unit has developed presentational methods to fit a variety of instructional needs. The primary concern of the unit is "to let the procedure fit the purpose," and, therefore, ITV operations at Purdue are guided by ultimate utilization. In a typical day's schedule television will be employed as a vehicle for total teaching, a device for image magnification, a "mirror" for the training of preservice teachers, a means of distributing illustrated lectures from a large hall, or a professionally produced, tightly edited presentation which represents months of careful preparation.

Personnel of the TV unit are skilled professionals who work with faculty members. Therefore, the highly competent television specialist does not find himself working *for* an instructor but, rather, expects to become a member of the teaching team, involving himself as much as possible in the course subject matter. Naturally, the producer-director at no time intrudes on the content area. His interest is only in gaining an appreciation and understanding of the material in order that he might suggest effective ways of presentation.

Recording of instructional materials on videotape is based on the determined purpose for televising in the first place. As a rule, ITV for large enrollment courses with multiple sections will be taped. However, at no time is the material carried live and taped simultaneously for subsequent replays. Most large enrollment courses are carried in the catalog semester by semester. Departments considering ITV for such courses are persuaded to invest in the time and expense necessary for the careful preparation of materials which will be committed to videotape and are encouraged to review their tapes each year and remake those that need it.

An example of a videotaped course at Purdue is Psychology 120, an introductory course in the principles of psychology. During a summer, the instructor was released from regular teaching to organize the course for television, work with a producer-director in gathering materials, and produced four tapes of a 40-lesson series. In the fall and spring semesters, the instructor was released the equivalent of one regular course in order to prepare and record the remaining 36 tapes. The producer-director was available for consultation and preparation of materials throughout the entire production period. The actual run-through, camera rehearsal, and taping in the studio took an average of 4 hours for each 20 minutes of tape.

The 20-minute duration of each tape fits into the total design of the course. Graduate assistant instructors handle the multiple sections of students enrolled in the course. Each week they meet in conference with the TV instructor, a senior professor, and review the following week's tapes to become familiar with the content and to clarify concepts introduced therein. The tapes are shown during the first 20 minutes of the class period, with the balance of the hour handled by classroom instructors. Typically, the tapes are designed with an "open-end" format which leads in naturally to classroom discussion.

A videotaped course which applies even more extensive production is Psychology 545, Training the Slow-Learning, Brain-Injured Child. Working throughout the year with the Purdue Achievement Center, the TV Unit records vast amounts of observational material from special classroom activities, play periods, therapeutic sessions, and candid social moments of subject children and specialists working with them. Through careful editing, precise examples of the TV instructor's course content are woven into his presentation. Within the abundance of observational material accumulated, many classic and many rare moments are captured. The TV instructor, then, may use these examples in the most effective teaching mode. He may demonstrate in a single TV session, for example, the progress of a particular training technique with one child over a period of time; he may show in close-up a classic symptom, then repeat it several times; he may demonstrate, by recorded example, in slow motion or stop action.

Among the 25 courses presented totally or in part by television are those which, by their nature, do not require extensive production attention. Often emanating from large lecture halls, these courses are taught essentially in the conventional manner with television serving primarily as an image magnification device and a distribution vehicle. Students in the originating hall may refer to the instructor at the front of the room or to a nearby monitor. Overflow classrooms are equipped with talk-back facilities as well as monitors so that students in these remote locations may ask questions.

Special applications of intradepartmental closed-circuit television are blossoming on the Purdue campus. These small, self-contained units are used in biology for amplification of microscopic views, in psychological research for long-term observation of animal habits, in industrial education for close-up view of the effect of heat or stress on structural materials, etc. The TV Unit also provides consulting services for departments. In all cases, the departmental closed-circuit television systems are self-contained and may be operated by departmental technicians or staff members.

Plans in development at Purdue propose a new telecommunication concept for the University which embraces all electronic media. The heart of the plan is a Telecommunication Center which would coordinate all combinations of interconnection within the University complex, including regional campuses. Medium- to broad-band electronic paths would have as their hub a switching control at the Center. The Telecommunication Center concept would serve well the inevitable interconnection of all of the state's universities and their regional campuses.

Television and the Stanford Microteaching Clinic

Stanford University, Stanford, California

Dwight W. Allen and David B. Young

The Microteaching Clinic at Stanford University was developed to reduce the complexities and traumas associated with the first teaching experiences of student teachers. Conventionally, a student teacher faced 30 or more students for 50 minutes the first time he taught. In addition, he had to await feedback on his performance until his supervising teacher had a free period that day or possibly even the following day. In either event, he probably had to wait until the following day before he could implement desirable changes.

The Pre-Internship Microteaching Clinic, consisting of three phases, provides a teaching encounter which is scaled down both in time and in the number of students. In the first phase, each teaching episode is 5 minutes in length and is recorded on videotape for playback during the critique. The class consists of four to six students. Each teaching episode is meant to provide genuine learning, for the intern faces a new group of students during the reteach phase.

In the critique period, the videotape is played back, and the supervisor can focus the student teacher's attention on specific aspects of the performance. This recording also provides a cumulative record of the intern's performance over the course of the summer and throughout the internship.

During the first phase, the intern teaches only 5-minute lessons in a teach-reteach sequence with an intervening 20-minute critique and planning session. The intern teaches two such sequences each week. A one-week break is scheduled before the second phase of the clinic is resumed. This phase consists of four to six interns grouped by subject matter area, charged with planning a series of 20-minute lessons. Each intern teaches two lessons which are videotaped and then played back during subsequent supervisory sessions. These sessions consist of peer, student, and supervisory evaluations.

The microteaching format appears to be particularly well suited to research and development of various technical skills of teaching (phase 3). Several research projects are conducted each summer and throughout the internship. These consist of interns' teaching a sequence of three 5-minute lessons with two intervening training sessions which vary according to design of the study and technical skill in question.

On the first day of the clinic each intern teaches a diagnostic lesson, which is then retained for comparison with a final lesson the last day of the clinic. Both lessons are 5 minutes long, and the teacher teaches a lesson of his choice within his subject matter field.

Each of the regular microteaching and research sequences just described emphasizes a specific technical teaching skill. That is, the intern prepares to practice only one skill at a session, with the supervisory (critique) session and viewing of the videotape restricted to this skill. Teaching skills such as reinforcing student responses, asking probing questions, varying the stimulus situation, using silence, and others are continuously being identified and training protocols developed.

Numerous college instructors utilize videotape and the microteaching format to improve their own teaching methods. They may request that certain portions of their classes be videotaped on a certain day. They then schedule playbacks of these recordings to permit analyses of their teaching performance. Following such playbacks and self-appraisals they may then have their classes recorded a second time and again view the playbacks.

In addition to viewing performance alone, college teachers often ask groups of their colleagues or senior staff members to view performances with them. During such sessions, one or two particular aspects of a performance will be selected for special consideration and discussion.

Central to the Stanford University use of videotape recordings is that they are independent of the microteaching program described above. That is, microteaching is effective without the feedback provided by the videotape. However, supplementing microteaching with videotape feedback makes the former even more powerful as a training protocol.

The portable TV recording units utilized in the microteaching and classroom recording of college teachers are self-contained, with all components installed in a cart. The vidicon camera is mounted on a removable board which sits atop the cart. The recorder is mounted in the bottom of the unit and is connected to a patch panel on the top deck. The unit also contains a small 5-inch monitor, a mixer-compressor-amplifier, and a wireless microphone and receiver. Operation of the unit has been simplified to the point that one college undergraduate can now roll it into the classroom and prepare it for recording in 4 minutes. Due to the absence of multiple microphones, multiple cameras and additional lighting, the recording procedure itself is relatively unobtrusive.

An Interbuilding Random-Access Closed-Circuit TV Communication System

University of California at Berkeley

Ken Winslow

Applications of closed-circuit TV techniques at the Berkeley campus of the University of California support and encourage face-to-face contacts of teacher and student and introduce resources, experiences, and efficiencies not otherwise available to student learning contexts including self-study, tutorial, seminar, discussion, laboratory, and lecture meeting formats.

Photo by Charles H. Stamp

Television provides the highly visual field of art with a useful medium for instruction. (Illinois Teachers College, Chicago North)

TV techniques used most by faculty and students involve the preparation and utilization of recorded presentations. Real-time uses of television generally are limited to visual aids (overhead camera or TV magnifier). Subjects and materials for TV and film coverage are planned and organized for presentation to the camera. A variety of studio and nonstudio production facilities for videotape and film recording are available.

Faculty and teaching departments representing all disciplines are accumulating an extensive library of recorded videotape and film presentations. At this writing over 350 reels of recorded videotape and film are inventoried to departments and on deposit in the library.

Library-recorded presentations follow, but are not limited to, three general forms of organization. *Lectures* average 30 minutes in length and are recorded as sequentially related direct-to-the-camera presentations and demonstrations (engineering graphics, optometry, industrial processes, Fortran, etc.). *Modules* are generally 15 minutes or less in length and are impersonalized presentations of processes or procedures, mainly in the life sciences (physiology, biology, etc.). *Documentaries* are generally 30 minutes and longer and represent unique and unusual materials, interviews, or experiences (German, social welfare, sociology, botany, criminology, forestry, law, oral history, speech, etc.).

Where televised presentations from the videotape and film library are utilized as core instructional material, the average size of the viewing group ranges from 20 to 30 students in individual seminar, discussion, and laboratory sections conducted by the teaching staff. Opportunity for discussion prompted by televised presentation and led by the instructor is regularly provided just prior to or just following the televised presentation.

The library is maintained at a Master Distribution Center (MDC). A closed-circuit wire TV communication system is operated from the MDC. Production and technical support is provided to several satellite closed-circuit systems about the campus. Five buildings provide a total of 28 classrooms, each connected to the MDC and permanently equipped with a video monitor, a speaker amplifier, and accessory items. All terminal room display stations serviced by the MDC are fully and remotely controlled from the MDC.

From any of these 28 rooms a voice request (via an intercommunication system) may be made at random to start, stop, or otherwise change a scheduled presentation. The MDC has now available to it five videotape sources, one 16mm film source, two VHF/UHF broadcast tuner sources, three live camera sources, and a variety of sound sources for individual or simultaneous distribution to one or more display stations in any combination.

The closed-circuit wire communication system is designed, constructed, and operated to support a wide spectrum of communication activities classified as picture, sound, control, data, and facsimile services.

Production capability centers about a mobile videotape and TV camera recording unit. Established in a truck, this facility is operated as a control room for a single-set TV production studio as well as a wide range of nonstudio originations. Several videotape machine standards are used. For master production recording of material that has potential use off campus or for which editing or transfer is contemplated, a broadcast standard videotape recorder is used. A second videotape machine of the same standard plus electronic accessories provides for initial master recording of material for later editing by rejuxtaposition, change, deletion, addition, and assembly of segments into a particular arrangement for immediate use without destroying the original material. Various teaching programs, e.g., criminology, social welfare, and mechanical engineering, have acquired master-recorded material in segment form and have assembled as many as three versions for separate and distinct purposes. For final storage and/or a library playback standard, several versions of the more inexpensive helical standard videotape machines are used. More are anticipated.

The program of television service covering the operation of all facilities, spaces, and schedule of production and distribution services outlined above, as well as administration of the TV communication service program for the campus, is staffed by six full-time professional employees. Additional professional and student staff are employed on an hourly basis. Professional staff are exclusively involved in all planning, production, and technical aspects of videotape and film presentations. Professional technical staff additionally undertake and supervise the design, installation, operation, and maintenance of all TV communication facilities in the Master Distribution system, as well as in satellite TV communication systems about the campus. Student staff, under supervision, operate the Master Distribution Center and "answer" calls for service from faculty and students from the terminally connected and equipped TV communication display stations.

Instructional Resources Laboratory

Graduate School of Education
University of Pennsylvania, Philadelphia
Hugh M. Shafer

The Instructional Resources Laboratory of the Graduate School of Education at the University of Pennsylvania is equipped with an instructor-operated closed-circuit TV and electronic student feedback system, all of which is to be backed up with a variety of individualized learning opportunities featuring the cross-media approach to teaching. Much of the electronic gear is original from the standpoint of design or reflects unique adaptations of existing components.

The laboratory consists of a 50-seat classroom and 10 surrounding rooms packed with mechanical and electronic teaching aids. Its purpose is to train teachers in the use of cross-media and multisensory techniques, to implement research dealing with new modes of teacher-pupil communication, and to provide school administrators with guidelines for the purchase of instructional equipment.

The TV studio, which is one of the 10 smaller surrounding rooms, measures only 10' x 14'. It is linked by coaxial cable to the main laboratory, a large classroom on the floor above, a small conference room, three of six individual learning carrels, and hopefully in the near future to the Education Library one block away. Careful organization and prepreparation of instructional media makes it possible for a lone teacher to operate all studio equipment and teach, using a great variety of instructional inputs. In a sense the concept is that of a one-man television station with electronic printout as well as audio and video forms of student feedback, thereby making possible instantaneous evaluation of the effectiveness of information transmitted.

Three vidicon interlacing cameras operate in the studio from a central teacher's console, and a fourth camera is fixed in the front of the main laboratory for purposes of bringing video feedback to the teacher inside the television studio. Microphones provide two-way audio contact between the studio teacher and the class. With the three studio cameras, one of which is equipped with a zoom lens and remote pan and tilt as well as focusing potential, the instructor can photograph and use in black and white any type of instructional medium.

The teacher's console also contains jacks for live microphone input, a four-speed record player, and controls for operating four audiotape recorders and a videotape recorder from the adjacent equipment rack. Moreover, it is possible to tape both audio and video materials directly from off-the-air programs and incorporate these materials into locally originated instruction.

Another of the three studio cameras is of the viewfinder type which can be remounted and placed on a tripod stand for transfer to other rooms in the building where it can serve to teach camera techniques and also to put on line or tape record single camera lessons or presentations.

Each student station in the main laboratory is equipped with a four-button response panel for answering questions on the material transmitted in the sequence of instruction. An electronic tabulator in front of the studio console shows immediately what percentage of the class has been successful in receiving the communications. If the percent of success is sufficiently high, the instructor would go on to develop the next micro-objective by mediated instruction, or he might switch to classroom instruction with media or to direct classroom instruction. However, a second electronic device in the studio gives a hard copy printout which identifies all students who failed to understand and at which points they ran into difficulty. It is from these latter records that students are branched into other learning activities before the next class period, thereby making it possible for them to keep up with the regular group. Ultimately it is hoped that the instructional program will have from six to eight different ways of communicating the same basic information to learners needing supplementary instruction. It is within the nine other smaller rooms surrounding the main laboratory that such opportunities are to be provided — including the use of single-concept films, filmstrips, slides, graphics, programed instruction, audiotapes, 8mm sound instructional films as well as 16mm, along with opportunities to dial from one of the learning laboratory carrels to rehear the original instruction by means of videotape. The conclusion of this branching procedure, which might also include direct instructor-student conferences, would be retesting, teaching, and retesting until the objectives of the instructional program were completely satisfied.

In addition to a six-station learning laboratory with a highly sophisticated teacher console, there is a well equipped darkroom with modern cameras, a soundproof audio recording and playback room, a graphics division, a programed-instruction reading room with samples of teaching machines, a duplicating and facsimile room, a chart storage room, an equipment bay, a woodworking table with hand and craft tools, facilities for demonstrations and dramatizations involving theater curtains and movable spotlights, both front and rear projection screen facilities, a clay sink and table for ceramic work, and movable furniture of the Brunswick type in different colors and shapes to accommodate a variety of laboratory furniture arrangements.

Instructor-Controlled Closed-Circuit Television Used Within Classrooms

University of Washington, Seattle
Walter L. Dunn

During the last 5 years the University of Washington has provided three kinds of instructor-controlled closed-circuit TV facilities for teachers interested in trying the overhead camera system. Although closed-circuit television has been used extensively in the conventional ways in the Dental and Medical Schools since 1956, this discussion is concerned only with the use of television (a) within the classroom and (b) under complete control of the instructor.

The two-camera system, which can be used to teach up to four sections of the same class at the same time, has been in use in general engineering classes since 1963. The two cameras are located in front of a large classroom, one suspended from the ceiling in a vertical position and equipped with a zoom lens. The overhead camera is used for all calculations, sketches, and magnification of visuals and models. The second camera, mounted on a tripod and dolly, is ordinarily used in a fixed position for a head-and-shoulders view of the instructor. The picture and audio signal can also be shown in three other classrooms in the building.

This system is used primarily by about half of the instructors in the General Engineering Department; all the regular first-year engineering courses have been taught using these TV facilities, which have also been used for a quarter or two by teachers of mathematics, German, French, architecture, mechanical engineering, and electrical engineering.

This two-camera system is used in a number of teaching situations — as a visual for in-the-classroom teaching (one class only) or for multiple sections (two, three, or four) of the same course taught at the same time. Multiple-section teaching offers a number of different possibilities. In general engineering classes a regular instructor is present in each classroom at all times. Ordinarily television is used only about half of each period, either intermittently or for the first part of the period. Each session includes a well prepared presentation on the topic for the day. Students are required to respond by answering questions, working part or all of a problem, or doing part of a sketch or drawing. TV presentations are usually rotated among the instructors involved, so that they can observe the teaching of their colleagues.

The four classrooms also can be used with an experienced instructor doing all the TV teaching and with a teaching assistant present in each of the classrooms. Thus the course is coordinated and presented by the experienced professor, the teaching assistants can observe the experienced instructor, and the students are provided a follow-up by the teaching assistants through answering questions and working problems.

In 1964 a one-camera overhead system was installed in a 228-seat auditorium. The overhead camera is provided with a zoom lens and is used for magnification and for projecting visuals. Courses range from liberal arts and philosophy to mathematics and zoology. Usually, but not always, instructors of mathematics and science courses will use the overhead camera system; the others do not. A few instructors in botany, zoology, geology, and meteorology are very enthusiastic about utilizing this system, while other instructors want the equipment turned off while their class is in the room.

The mobile teaching console is equipped with one overhead camera (suspended by an arm on the side of the desk), a zoom lens, and the instructor's monitor. The arm is so constructed that the camera can be lowered quickly to use with a microscope. One monitor on a separate mobile stand will also be provided for student viewing. This mobile unit will be loaned to interested instructors in areas such as biology, zoology, and sanitary engineering.

The advantages of instructor-controlled television over other media are that it can be used to magnify a visual picture or model (up to about eight times) and that it can distribute the visual picture to monitors within the same room or to other rooms. The overhead camera with zoom lens is an excellent teaching tool and can be used to do the same things that can be done on the chalkboard, with flip charts, overhead projector, opaque projector, and slide projector.

The instructor faces his class at all times and is always in charge of the presentation because the few controls are operated by him. The TV equipment is turned on and adjusted each morning and is left on during the day. When the instructor walks into the classroom, the equipment is ready for use.

There are, however, disadvantages to using television. The TV equipment is an added expense, and it must be justified by improved instruction and/or a greater number of students per teacher. Although students adjust to and accept good television teaching readily, instructors do not! The biggest disadvantage is that instructors are reluctant to change their methods of presentation (and a change from the typical chalkboard is necessary) and that considerably more preparation and coordination time is required.

An evaluation was made of four different freshman engineering classes (92 students total) in 1963, and one of the questions asked was: "How much more helpful do you feel classroom television has been over conventional college teaching?" The choices of response and percent answering for each were: considerable, 52 percent; some, 37 percent; none, 3 percent; and undecided, 8 percent. The advantages listed by the students included television conveys ideas and information faster and/or better, 61 percent; it is easier to watch, better for large classes, as all can see, 62 percent; the teacher can make better use of class time, 24 percent.

Classroom TV teaching, like any other kind, may be good, bad, or indifferent. It does offer the instructor a means of improving communication with his students. At the University of Washington, teachers are encouraged to investigate the possible use of television for two reasons: first, to improve their teaching, and second, to determine if they can reach more students and still improve the quality of their teaching. Any interested instructor on campus may observe these TV facilities in use and may also arrange to have his class assigned to one of the classrooms where television can be used. The overhead camera system used within the classroom is relatively inexpensive and provides a good starting place for TV teaching.

Television and 2500 MHz Facilities
Wayne State University, Detroit, Michigan
Rhoda Bowen

Detroit Education for Nursing via 2500 MHz Television, a project under the aegis of the College of Nursing, Wayne State University, involves 12 schools of nursing in metropolitan Detroit with an estimated 1,500 nursing students. It is made possible by a grant from the U.S. Public Health Service under the Nurse Training Act of 1964 (P.L. 88-581), project grants for improvement of nurse training.

Under this grant videotaped lessons concerned with the nursing process, taught by the best qualified nursing instructors, are televised to 12 schools of nursing in metropolitan Detroit. The project also introduces the utilization of television in nursing education to graduate nursing students at the College of Nursing who are preparing to teach in schools of nursing.

With the 2500 MHz instructional TV system, audio and video signals are fed from the studio or video transmission room. The transmitter itself is attached to a 500-foot tower atop the Detroit Public Schools Center Building in the university campus area.

At each participating school, a receiving antenna specifically selected to suit the geographical arrangements of the receiving building is mounted on a small tower. From the antenna, the 2500 MHz channel immediately goes to a converter which changes it to a VHF channel. This VHF signal is then distributed to standard VHF TV receivers in classrooms.

Resources of the Division of Mass Communications available and used by this project include production facilities (in studios that once housed WXYZ, a Detroit commercial television station), consultation service for production aides and graphics, production equipment, technical resources, and engineering equipment. One producer-director assigned to the nursing project works closely with the project director.

To date, Unit I, "Basic Nursing Skills," has been taped. This unit includes 13 half-hour lessons and 1 one-hour lesson. These lessons are concerned with basic manual skills used in the practice of nursing such as making beds, giving baths, and taking temperature, pulse, respiration, and blood pressure. A student Study Guide also has been developed and is used by the student for preclass preparation. Principles and guides to action are listed as well as outlines of content to be presented. By making this preclass preparation and not taking notes during the teleclass, students are able to concentrate on demonstrations or materials presented. Each unit of lessons developed in the future also will have such a student study guide.

Work has now begun on Unit II, "Basic Nursing Skills," which will be concerned with aspects of communication, interpersonal relations, observations of patient and environment, and the nurse's responsibility in using various kinds of equipment. Future plans include the development of lessons concerned with the more complex nursing processes in the care of adult patients.

During the first year of operation of the project, reports from participating schools included indicate that instructors are relieved of repetitive teaching and have more time to develop other lessons and/or work with individual students; students are enthusiastic, ask more questions, and are doing better in the clinical situation in the performance of basic skills.

INSTITUTIONAL INVENTORY

Abilene Christian College, Abilene, Tex. CCTV used for school observation prior to student teaching; also in human development, methodology courses, and adolescent psychology. (Orval Filbeck)

Antioch College, Yellow Springs, Ohio. Videotapes used by students in speech workshops to view groups or selves; in Chinese classes as part of the instruction. Also, as basis for improvement of teaching through self-observation, instructors videotape their classes. (Steven Perry, Carl Christensen, and Robert Devine)

Appalachian State Teachers College, Boone, N.C. High school and college hall are linked for teacher training (16 channels, with 2 cameras in each of 3 classrooms). TV projection now installed in multimedia-equipped octagonal building. Two-way TV facilities are installed in each classroom of one building. (John Pritchett, Jr.)

Arkansas State College, Jonesboro. Will begin use of CCTV in fall 1967 in 2 ways: (a) It is anticipated that 22 different courses will use the system in some way during the school year; (b) the Department of Radio-TV will use it to train students in TV broadcasting. (Charles Rasberry)

Austin State Junior College, Austin, Minn. Has completed (with Rochester State Junior College) a feasibility study for use of TV materials in the classroom. Thirty-two videotapes, each approximately 20 minutes long, were produced for use as the nucleus of diploma nurses' chemistry courses in both colleges. (Rex Q. Sala, Kenneth O. Makinen, and Gordon R. Meyers)

Ball State University, Muncie, Ind. Uses student actors to dramatize (on videotape) situations in physiology and health education. Excellent facilities available. (William H. Tomlinson)

Bemidji State College, Bemidji, Minn. Uses CCTV for directed observation of unrehearsed laboratory school classes by education students. (Harold D. Fleming and Vern R. Thomas)

Boston University, Boston, Mass. CCTV used for teacher-training purposes; includes microteaching and classroom observation. (Gaylen B. Kelley)

Bowling Green State University, Bowling Green, Ohio. In speech 2 class sessions per week are presented by a team of teachers via TV. Groups of 15 students have a weekly performance session with graduate students for critique. In music, teaching demonstrations in each grade are videotaped, with pre- and post-demonstration lectures, for viewing by music education students. Instructional Media Center provides portable VTR chain for taping classes in public schools for observation by future teachers. (Duane E. Tucker and Glenn H. Daniels)

Brandeis University, Waltham, Mass. CCTV used to supplement and enrich the curriculum. One project involves the collection of videotaped interviews with a variety of persons from other nations (oral history). It is planned to transfer videotapes to film. (S. Leonard Singer)

California State College at Fullerton. In planning stage for a TV service facility. Conduits have been provided in all buildings. A 2500 MHz fixed system will unite this college, Fullerton Junior College, and seven contiguous public school districts. (William R. Shultz)

Carleton College, Northfield, Minn. Purposes of this institution's pilot program are to (a) determine the feasibility of using portable, relatively low-cost TV equipment to record unrehearsed teaching-learning activities; (b) produce a limited number of edited videotapes for use in professional education courses; and (c) experiment with the use of videotapes in appraising and improving performance of student teachers. (Willis D. Weatherford)

Central Missouri State College, Warrensburg. CCTV used for classroom observation in methods and educational psychology classes to allow more observations per student and to accelerate and intensify learning experiences prior to student teaching. (Warren C. Lovinger)

Central Washington State College, Ellensburg. Two TV laboratories, one mobile, serve teacher education, physical education, and psychology for observation and microteaching. In one quarter, 3 professors scheduled 203 hours in 30 courses serving 1,512 students. Videotapes are edited and dubbed onto other tapes so that 50 minutes of public school class time may require only 10-15 minutes of college class observation time. (Charles Vlcek)

Chicago City College, Chicago, Ill. TV College broadcasts on WTTW-Channel 11, about 25 hours weekly. Students enroll at one of the City College campuses, take examinations there or at other sites by arrangement. In 10 years, 140 students (some ill or in prison) have earned associate in arts degrees. About 1,300 have completed a full semester of credit study via TV. (James J. Zigerell)

Chico State College, Chico, Calif. TV Services Center follows a master plan for developing services on campus toward direct teaching, observation of classrooms in teacher training, administrative uses, mobile pickup, cultural enrichment, videotape in teaching, and classroom image magnification units. (Garrett L. Starmer)

Colgate University, Hamilton, N.Y. Videotape permits team teaching in economics without unduly increasing faculty load and in education for observation by students and supervision of student teachers. Uses being planned also by foreign languages and other departments. (George E. Schlesser and Lester H. Blum)

College of Great Falls, Great Falls, Mont. For 10 years, courses for full college credit offered over 2 Great Falls commercial stations have been open to regular students and others wishing to enroll. There is no charge to college for use of broadcasting facilities. (Patrick E. Lee)

Colorado State University, Fort Collins. Videotapes utilized for portions of about 20 courses that tapes can best handle. "Total TV" is not anticipated. CCTV instruction of 1,200 students in psychology provides the sample for a study of attitude changes during learning. (C. O. Neidt and Preston Davis)

Columbia Theological Seminary, Decatur, Ga. Sermons practiced before 5 classmates are videotaped, immediately replayed, and evaluated by peers and student ministers. Repetition of the sermon follows. Interpersonal tasks of the minister practiced by means of videotaped role playing are similarly evaluated. (Hubert V. Taylor)

Concordia Teachers College, River Forest, Ill. This institution's Mass Media Center has TV studio and microwave facility connecting to another campus, plus 4-channel 2500 MHz to serve in a variety of functions. (Martin J. Neeb, Jr.)

Creighton University, Omaha, Nebr. Uses CCTV in classrooms equipped with two-way sound. (R. C. Williams)

Delaware State College, Dover. This institution is connected to a statewide system of public school TV by 2 TV cables, 1 a 3-channel system, and the other an independent cable. One campus building completely equipped for viewing CCTV; new buildings will carry all necessary facilities for it. (Richard C. Walker)

Duke University Medical Center, Durham, N.C. Most TV instruction here is adjunct to other instruction and taken from videotapes ranging from 4½ to 50 minutes in length. Used to help in all areas of medical, surgical, nursing education, and hospital care. (Sam A. Agnello)

Eastern Kentucky University, Richmond. Teacher education multimedia facilities installed; coaxial cables to all buildings are planned; community TV antenna for University only is now atop a 21-story dormitory building. (James S. Harris)

Eastern Michigan University, Ypsilanti. Six buildings linked by 6 CCTV channels. (Verne E. Weber)

Fairmont State College, Fairmont, W. Va. Uses classroom CCTV camera and monitor (which is also adaptable for open broadcast reception) to enable instructors to present demonstrations and enrichment very inexpensively ($500 per classroom for equipment). (James A. Hales)

Gannon College, Perry Square, Erie, Pa. Student teachers teach a well prepared lesson before fellow students and the camera for 5-10 minutes. Tapes are not used. Students view the teaching in another room and discuss performance later. (Charles L. Alcorn)

General Motors Institute, Flint, Mich. Videotapes made of performances of speech students. (Steve Cenko)

Gorham State College, Gorham, Maine. Students on campus, with education professor in room with them, observe public school classes in action. Instructor on campus controls camera and can discuss events while they are proceeding in the public school classroom. Coaxial cable carries signal. (Everett A. Davis)

Hahnemann Medical College and Hospital, Philadelphia, Pa. TV permits magnification of surgical fields so that surgeon can direct his instruments by watching the monitor. Observers can also be accommodated (especially useful in neurosurgery). (J. L. Osterholm, M.D., and Jack Pyneson)

Illinois State University, Normal. CCTV distributes either commercial or locally produced signals to 200 locations in classrooms and dormitories on the campus. Mobile unit now being equipped. (William C. Prigge)

Illinois Wesleyan University, Bloomington. Permanent installation of CCTV camera now made in 1 science lecture room as a start in utilization. Further expansion is planned. (Everette L. Walker)

Indiana State University, Terre Haute. Laboratory school observations by education classes. Nine courses regularly taught by CCTV. (James Boyle)

Iowa State University, Ames. In 1966-67, CCTV brought to more than 8,000 students 50 courses in 11 departments of 4 colleges on this campus. (George C. Christensen)

Jacksonville State College, Jacksonville, Ala. Funds granted in 1966 for installation of CCTV and other instructional media. CCTV plans still being developed. Also acquiring 16mm motion picture and 35mm still projectors, record players, tape recorders, and overhead and opaque projectors. Plans further use of multimedia facilities and resources to improve instruction in many areas. (Alta Millican)

Junior College of Broward County, Fort Lauderdale, Fla. This institution is part of the South Florida Education Center containing Nova High School. A large TV studio complex to serve the entire Broward County area (2500 MHz ITV) now under construction. In it will be offices, graphic arts production center, master and studio control rooms, 2 large studios, reference and other resources, spaces for writers, producers, and other professional personnel. Extensive use of CCTV planned for the future. (George H. Voegel)

Junior College District of St. Louis—St. Louis County, St. Louis, Mo. Experimentation under way with motivational devices in programed videotape in physics; student videotaping in speech; biology experiments recorded by microscopic videotapes. (David Underwood)

Kansas State Teachers College, Emporia. Shares videotapes in teacher training with other (private) colleges not having laboratory schools. (J. T. Sandefur)

Kent State University, Kent, Ohio. Seven courses videotaped and presented via CCTV. Laboratory school equipped for observation by college students. Interroom monitoring of experiments in psychology. Observation by trainees of videotaped counseling interviews. Twelve signal sources available and elaborate cable distribution provided to classrooms and dormitories. (Philip A. Macomber)

Lafayette College, Easton, Pa. Elaborate CCTV in classroom and cubicles permits presentation of experimental stimuli or observation of human or animal subjects. (J. Marshall Brown)

Lewis and Clark College, Portland, Oreg. CCTV used for practice teaching. Mobile TV units go into elementary schools. (Keith A. Acheson)

Loretto Heights College, Denver, Colo. TV used in teacher training (microteaching). (Sister Jane Godfrey)

Los Angeles Valley College, Van Nuys, Calif. Two courses for credit are offered over local public educational TV station; a continuing series of lectures is offered by instructors over another open-circuit station. (Kermit Dale)

Louisiana State University, Baton Rouge. Has recently expanded its CCTV services to include those for teacher training. Future teachers will be able to observe "live" education in the laboratory school from classrooms in other buildings. CCTV also used for instruction in business administration. (L. L. Fulmer)

Madison College, Harrisonburg, Va. Observation of elementary classrooms; taped lecture dissemination into 5 classrooms. (Walter Heeb, Jr.)

Marycrest College, Davenport, Iowa. CCTV used in education to observe classes and to provide self-study opportunities for student teachers. (Sister Joan Sheil)

Maxwell Air Force Base, Montgomery, Ala. CCTV used in professional courses for Air Force officers. Provided from a central studio system. Also provides a special laboratory studio for "teaching instructors to teach by TV." (Wendell A. Hammer)

Memphis State University, Memphis, Tenn. ETV station, WKNO-TV, operated on campus, with students doing much of the technical production work. (Ronald S. Alford)

Michigan State University, East Lansing. Large-class lectures transmitted to campus and dormitory classrooms by CCTV. During 1965-66, some 170 courses enrolling 53,000 students used CCTV for a total of 56,000 TV student credit hours. (Erling S. Jorgensen)

Midwestern University, Wichita Falls, Tex. Two multimedia auditoriums with microscope, floor and zoom cameras, TV camera console, and videotape recordings; 63 monitors installed in various classrooms and laboratories. (C. T. Eskew)

Monroe Community College, Rochester, N.Y. 2500 MHz system will connect 4 colleges for exchanges of TV programs; 2 complete roll-about units (2 cameras, plus videotape, and monitor) available for use in science. Nursing department has 24 cameras in Rochester General Hospital for monitoring (and taping) student nurses in action. (Eugene Edwards)

Morehead State University, Morehead, Ky. Studio, 2 TV cameras, and helical-scan taping facilities to be in operation July 1, 1968. Campus-wide coaxial cables. At present, observation and demonstration teaching in teacher training, English composition. (N. Tant)

National College of Education, Evanston, Ill. Observation of classroom teaching. Recording of "peer" teaching. (Stuart P. Vincent)

Nebraska Educational TV Council for Higher Education, Inc., KUON-TV, Lincoln. All Nebraska higher education institutions are members of this council. Two courses for credit by TV offered spring 1967. Colleges enroll their own students, hold on-campus meetings, decide on credit. Complete freedom given to each institution. A statewide meeting of all college faculties is held at intervals for orientation purposes. (M. Scheffel Pierce)

New Mexico State University, University Park. Has conducted English composition comparison experiments involving TV. Taught class on cinema via CCTV. (Linden Fisher, Harvey Jacobs, and Orville Wanzer)

North Carolina College at Durham. TV presentations are videotaped for use by teaching assistants in receiving rooms for small-group viewing and by students who simply want to review. Difficult portions of courses programed (involving 8mm films and other resources). (James E. Parker)

North Orange County Junior College, Fullerton, Calif. Building faculty experience with TV at this time, in preparation for use of more sophisticated installation now under construction. (Otto Roemmich and J. B. Nance)

Northern Michigan University, Marquette. Videotape information provided portions of 2 basic common learning courses for replay to 4,500 freshmen and sophomores. (William G. Mitchell)

Northwest Missouri State College, Maryville. CCTV being used in teacher education program to observe teaching techniques and students in laboratory school. All rooms in school wired; equipment can be used for any grade level or classroom situation. CCTV also used in laboratory school for performing arts. (Luke L. Boone and Richard Houston)

Northwestern University, Evanston, Ill. Videotapes of advanced theoretical chemistry course as used on main campus judged to have saved as much as 60 hours per week of travel time by medical school students on downtown campus. Videotape recordings used in industrial engineering and management science to train graduate students in interviewing techniques for research. (Charles F. Hunter)

Ohio State University, Columbus. CCTV brings as many as 9 channels to 32 on-campus classrooms seating 2,320 each hour. Open-circuit video classes also provided on WOSU-TV. (John T. Mount)

Orange County Community College, Middletown, N.Y. One hundred nursing students receive instruction via TV from hospital to classroom; courses in pediatric and obstetric areas. Judged to increase opportunity for and effectiveness of clinical observation. (Margaret June Simpson)

Oregon State University, Corvallis. All TV at OSU is via videotape; audiotapes and slides of originals used on presentations are completed simultaneously. Students can later check out and review these units independently at Self-Learning Center. (Harold Livingston)

Pennsylvania State University, University Park. Videotapes are microwaved and sometimes physically exchanged among 6 campuses. Utilization emphasizes ways of complementing the taped course material, as by discussion leaders, programed assignments, or telephone amplification for discussion with professor who made tape. (Leslie P. Greenhill)

Purdue University, Lafayette, Ind. Television unit used for entire classes, image magnification, self-observation for future teachers, dissemination of classes all over campus, and dramatic presentations. Purdue-Indiana University's TV Microwave Link (reported in 1963) has now grown to 25 class hours per week (1966). The 2 universities use the link to engage jointly in courses, advanced seminars, symposiums, and adult education conferences. (James S. Miles and Warren F. Seibert)

Rensselaer Polytechnic Institute, Troy, N.Y. Experimental classroom specially designed for TV magnification in engineering, chemistry, and other courses. (C. O. Dohrenwend)

St. Cloud State College, St. Cloud, Minn. Open-circuit telecasts made for credit in fine arts, sciences, education, industrial arts, psychology, over St. Paul station. Students also meet with instructors 2 or 3 times each quarter. (Luther Brown)

San Bernardino Valley College, San Bernardino, Calif. TELECOM, the college's educational broadcasting department, housed in the Division of Telecommunications, provides both terminal and transfer courses in professional broadcast training and operates a TV and an FM channel, plus 2 CCTV channels. ITV is both broadcast and closed-circuit. Curriculum at the college level includes political science, economics, biology, hygiene, home economics, accounting, and specialized courses in fire science, income tax, and typing. (E. R. Rothhaar)

San Jose State College, San Jose, Calif. College provides 2,500 student viewings per semester of public school classrooms by College-owned mobile videotape unit. Library of videotapes now being edited to extend scope of observation experiences. Microteaching also used with student teachers. (Richard B. Lewis and Warren Kallenbach)

South Dakota State University, Brookings, S. Dak. Uses 4 remote-controlled TV cameras in local hospital, with reception on campus, as part of nurses' training. (Woodrow P. Wentzy)

Stanford University, Stanford, Calif. Interns in secondary school teaching are prepared for their first school service by presenting before a TV camera a series of 5-minute lessons before 5 high school students. The resulting tape is immediately viewed and evaluated, after which the lesson is retaught to another group of students. (Dwight W. Allen and David B. Young)

State University of New York (SUNY), College at Brockport. A series of short videotapes treat techniques, processes, skills, and other complex demonstrations for presentation as parts of conventional class sessions. Student teachers in the classroom (not "micro") are videotaped several times for replay and self-evaluation. (Jack B. Frank)

SUNY, College at Geneseo. CCTV in one new building, and a mobile unit for observing student teachers. (Clarence O. Bergeson)

SUNY, College at Oneonta. Economics lecture, presented by TV to most of class, will be transferred to 8mm film cartridges, and 60 students will be taught experimentally only by these films (spring 1967). (Sanford D. Gordon, F. Brooks Sanders, and Foster Brown)

SUNY, College at Oswego. Videotapes used in teaching golf; also in teaching techniques of diagnosing and evaluating pupil reading performances. This institution has developed a pilot project in using videotapes to help nonmusicians understand music as a form of expression. (Thomas C. Brennan, Robert Caulfield, and Anthony J. Crain)

SUNY, College at Potsdam. Programs in French picked up from Montreal TV stations and disseminated on campus. TV studio is connected to all science classrooms; campus laboratory school is cabled for observation by student teachers. Demonstrations and teaching sequences are videotaped. (Robert C. Henderhan)

Stephen F. Austin State College, Nacogdoches, Tex. College science building permits televised demonstrations from a laboratory to lecture hall seating 500 students, or to several elementary laboratories seating 75. Presentations also made available on videotapes for repeated showings. (J. N. Gerber and E. L. Miller)

Stout State University, Menomonie, Wis. Microteaching (Lorry K. Sedgwick and Harlyn T. Misfeldt)

Sul Ross State College, Alpine, Tex. A plan proposed for color TV to schools through West Texas. Innovative Education Project, associated with SRSC Multimedia Center. (Bob W. Miller)

Teachers College, Columbia University, New York, N.Y. Recently conducted a Demonstration Project of Programed TV Instruction in cooperation with WETA-TV, Washington, D.C. Purpose: To demonstrate "group-paced programed TV." (Sidney Forman and Edward J. Green)

University of Akron, Akron, Ohio. Using CCTV in the guidance laboratory to improve interview skills of prospective pupil personnel workers. Used by increasing numbers of students each year. (James Doverspike)

University of Alabama, University. Maintains a central taping area; cameras spread out over the campus. Five events can be taped at one time. (James R. Jensen)

University of California, San Francisco Medical Center. The Communications Office for Research and Teaching operates a 2500 MHz TV transmitter for teaching medical school students. (Irving R. Merrill)

University of California at Berkeley. Now accumulating a library of videotapes on many subjects and in 3 forms: (a) lectures, of usually 30 minutes in length; (b) modules of about 12-15 minutes to bring to class demonstrations otherwise very difficult to introduce effectively; and (c) documentaries — interviews, historic occurrences. (Ken Winslow)

University of California at Irvine. Course offerings specifically programed for CCTV presently impossible because of newness of institution. Natural Science Building is wired for CCTV. (Bill Stead)

University of California at Los Angeles. Academic Communication Facility provides engineering, creative production, technical and personal services to faculty and administrative groups. (Frank E. Hobden)

University of California at Santa Barbara. Lectures televised to small classrooms on campus. Now planning a more complete communication center. (A. Dale Tomlinson)

University of Colorado, Boulder. Portable vidicon equipment and TV tape recorder permit program production at any location. Experiments are taped for later viewing; school observations have been gathered; university activities are recorded for later open-circuit broadcasting. Twelve-channel community antenna TV capability now available to each classroom building and dormitory on campus. The TV facility is used very widely on campus. (R. E. deKieffer)

University of Connecticut, Storrs. TV dissemination to distant classes in aerospace engineering, with two-way voice communication. Videotapes in bacteriology presented with performing professor present in classroom while tape is shown. (Stanley Quinn)

University of Denver, Denver, Colo. Two-way sound; scheduled TV tapes to dorms and to classrooms; supplementary scheduled class sessions without TV for discussions. (Noel L. Jordan)

University of Florida, Gainesville. Three TV studios with multi-camera production are distributing to 2 open-circuit ETV stations and to 7 on-campus buildings. Nineteen classrooms of the laboratory school equipped to originate CCTV programs from mobile camera equipment. Includes two-way communication between university classroom and laboratory school. (K. A. Christiansen and James J. Thompson)

University of Hawaii, Honolulu. The Hawaii program for ETV is administered by the College of Education, University of Hawaii. Programs include in-school instruction for enrichment, in-service teacher training, adult programing. (Walter A. Wittich)

University of Houston, Houston, Tex. A "case history" on college teacher attitudes and uses of TV on campus. (Richard I. Evans)

University of Illinois, Urbana. Experimenting with televised lectures and televised programed instruction. (Charles J. McIntyre)

University of Kentucky, Lexington. TV used in Medical Center to magnify, transport, and record images in 472 sessions during 1965-66. (Michael T. Romano)

University of Maine, Orono. CCTV used in College of Education building combines remote control and portable cameras to give prospective teachers observation experience; to show videotaped lectures; and as a laboratory for speech and communication students. (Mark R. Shibles)

University of Miami, Coral Gables. TV tapes used in humanities, Western civilization, teacher education demonstrations, test administration, speech, law, and Medical School. (John A. Fiske)

University of Missouri, Columbia. Objectives of CCTV at the Laboratory School include: (a) teacher utilization of TV; (b) observation by student teachers; (c) instruction in use of TV; (d) creation of TV tapes so student teachers may see themselves in action; and (e) creation of kinescope tapes of superior teaching techniques, activities, and pupil attitudes and behaviors for use in in-service and student teacher training. (Robert Wood)

University of Nebraska, Lincoln. Forty hours a week of CCTV provide more than 45,000 student hours of instruction each semester. Economics, education, psychiatry, obstetrics-gynecology, engineering use it on schedule; other departments occasionally. Received in 14 buildings, from 8 different sources (including a courtroom). Statewide Nebraska Educational TV Council for Higher Education, Inc. (M. Scheffel Pierce)

University of Nevada, Reno. CCTV and tapes in child development observation, used in psychology for testing and interviewing techniques; also for observing student teachers and in nursing. (Donald G. Potter)

University of New Hampshire, Durham. New Hampshire Broadcasting Council centered at University of New Hampshire organizes, produces, and coordinates ETV for subscribing school systems in the state. (John Bardwell)

University of Oregon, Eugene. Closed-circuit and community antenna TV distribution system provides to campus (38 dormitories and 15 classroom locations) and off-campus living organizations and subscriber families: enrichment; shared experience of lectures, concerts, etc.; and experiences for student producers and crews. (William Willingham)

University of Pennsylvania, Philadelphia. Social Science Center includes a one-man studio to service 50-seat classroom equipped with two-way viewing and multimedia potential, plus a four-button student response system. A learning resources setup "with everything" is being built. Graduate School of Education has instructional resources laboratory. Purpose: to train teachers in the use of cross-media and multisensory approaches. (Hugh M. Shafer)

University of South Florida, Tampa. Students are involved in simple TV productions to give them the feel of the medium; supervisors have reported a keen awareness of role of TV in Florida's public schools. (Richard Cornell)

University of Southern California, Los Angeles. Uses series title, "Odyssey," for CCTV college classroom programs. Has produced films for 33 separate courses; presents about 7 or 8 courses per year. One of these each fall and spring, a credit course, concludes with a final examination on campus. (James Mathes)

University of Southern Mississippi, Hattiesburg. Application of microteaching to elementary teacher preparation. (John P. Van Deusen, Bennie G. Baron, and Ronald G. Noland)

University of Texas, Austin. Mobile videotape units used to observe student teachers. (John W. Meany and C. Victor Bunderson)

University of Texas at El Paso. CCTV used to observe counseling and individual testing sessions; also practice teaching sessions in the teaching of English as a second language (microteaching). (Virgil C. Hicks)

University of Utah, Salt Lake City. In fall 1965, 120 hours a week are broadcast from 2 CCTV studios. "One-man studio" allows professor to control TV picture from a push-button panel. Closed-circuit installation offers 14,000 credit hours of instruction to lower division classes. (Dail Ogden and W. Donald Brumbaugh)

University of Virginia, Charlottesville. Has experimented with CCTV to enable certain departmental libraries to serve as remote viewing stations for library materials requested by across-campus telephone. (Roger P. Bristol)

University of Washington, Seattle. CCTV within the classroom, entirely controlled by instructor, broadcast to another nearby classroom; also for better viewing in a large classroom. Mobile camera available for either use. (Walter L. Dunn)

U.S. Air Force Academy, Colorado Springs, Colo. In addition to continuing with TV (as outlined in 1963 edition), is using MIMIC (Miniature Mobile Instructor Controlled Television) involving a self-contained cart-mounted CCTV system for use in areas outside the normal TV distribution system. (Chester F. Caton)

U.S. Military Academy, West Point, N.Y. ITV used as an adjunct to the classroom instructor. Programs carried to more than 200 classrooms, with 4 large screen projectors in auditoriums and lecture halls. (William F. Luebbert)

Vincennes University Junior College, Vincennes, Ind. Basic communications course combines weekly a general session via CCTV; an audio-tutorial laboratory session; a writing and discussion session; and an individual counseling session. (Harriette Groscop)

Wabash College, Crawfordsville, Ind. CCTV disseminates laboratory demonstrations to all course sections at the same time — 5 laboratories in all. Used in anatomy courses and in general biology. (Willis H. Johnson)

Wagner College, Staten Island, N.Y. Considerable use of inexpensive equipment to extend advantages of CCTV to a small campus. (Al Wagner)

Wayne State University, Detroit, Mich. Detroit education for nursing program offered via 2500 MHz TV involves 12 schools of nursing enrolling about 1,500 students. Videotaped lessons are broadcast to all 12, for closer view of demonstrations by students. (Rhoda Bowen)

West Chester State College, West Chester, Pa. A mobile unit is shared by Cheyney State College and West Chester State College (5 miles apart) and also used to video-tape student teacher performance. (Arnold Fletcher)

Wisconsin State University at La Crosse. A listening laboratory and audio-tutorial facilities now in the process of being installed. (V. B. Rasmusen)

Wisconsin State University at Oshkosh. Now in process of planning general utilization of several types of TV. (Frederick J. C. Mundt)

Wisconsin State University at Platteville. TV for classroom enlargement, videotape recording of broadcast programs, recording of student teachers. Several expansions of facilities and uses now in planning stage. (Glenn G. Brooks)

SUMMARY

There is no longer any question as to the efficacy of television in extending and improving instruction in higher education. In nearly every situation where it has been tried and carefully evaluated, results show that it permits learning equal to and not rarely superior to that achieved under traditional classroom practices. In addition, it does make possible several kinds of learning that were most difficult or impossible to provide before its introduction to the educational armory.

Now it remains to be seen whether higher education, under pressures of increasing enrollments and expanding knowledge, will rise to the challenge of learning to cultivate the rewards of this medium.

Several important and fundamental problems still persist with respect to the institutional use of television. One of them is proper choice of equipment. Television's potential contribution to instruction, the cost of equipment, and the effort of redesigning curriculum are all immense; it would be tragic if institutions were to invest so much in unsuitable or obsolescent hardware or course revisions that they became unwilling or unable to expend other necessary assets to keep up-to-date with rapidly improving techniques. As an example, color television adds so much to some kinds of communication that it would seem wise for every college to provide at least color-compatible equipment in its earliest investments. A similar problem now arises in choices among the numerous, less expensive but often noncompatible helical-scan video recorders and the much more expensive but broadcast-compatible quadruplex tapes. Another problem frequently encountered with institutional television is the failure to exploit its own best potential. It is uneconomic to use television simply as a carrier of sound; radio or audiotape can do that as well, and less expensively. Whether used by one or a thousand students, the added value of the TV screen is in the instructional visualization; and up to now this value has not been universally and intensively realized in colleges and universities.

But perhaps the gravest of all problems connected with the use of instructional television is the difficulty encountered in obtaining full participation and involvement of the faculty in developing and extending its potential. The contribution of television to college teaching is far from automatic; it is not a gift of the machine. Rather, it requires the energetic cooperation of a human teacher. There is at present no satisfactory technique to stimulate and to reward the effort that faculty members will need to make if they are to restate their behavioral objectives and recast their plans to bring about the marked improvement that television permits. Film and radio have fallen short of their maximum instructional potential for much the same reasons. Will higher education now be able to rise to the challenge of learning to cultivate the rewards of televised instruction?

IV

FILMS

THE MOTION picture was one of the first "new media" to be used in instruction. The 16mm silent film has had a 40-year history of utilization in classrooms in this country. Sound and color films became available for teaching almost as soon as they were introduced into theaters. Films still make important contributions to instruction, and several institutions of higher education are actively engaged in film experimentation.

The teaching film has several advantages. It is durable; it is available in a great range of titles and subjects; it may be rented (at very low cost) or purchased (at about the same cost as blank videotape of comparable time length). There is now available in this country an extensive library of commercially produced films developed specifically for instruction, supplemented by available theatrical films that often are useful in literature, drama, or history classes. For classroom showing, little technical skill and comparatively inexpensive equipment are required. The instructor who desires to show a film can be almost independent of other workers in his scheduling and treatment of the concepts presented.

There are disadvantages to film use, however, as compared to other more recently developed media used in the classroom. A film cannot be corrected or brought up-to-date as rapidly and as simply as the videotape. There is a constant problem of scheduling films rented from off-campus agencies, such that instructors may be forgiven for abandoning their use unless the prints are owned and stored on campus. In addition, the sheer physical labor of assembling the film, the projector, and the screen and setting up the equipment can be discouraging to any instructor who must care personally for all these details. In order to overcome these mechanical obstacles, it is common in newer buildings to have projection screens and facilities for room darkening installed in every instructional room, and projectors maintained permanently in or delivered to the classrooms. In many colleges, student projectionists are provided by audiovisual services at the request of the instructor.

Recent innovations in motion picture technology, production, and utilization indicate that the motion picture will not be entirely superseded by other techniques. As an example, at one junior college, instructors and learning resources specialists work together to produce 16mm sound films to be used as adjuncts to instruction in several of the basic courses with large enrollments and multiple sections. Typically, such a film may be shown as the introduction to a unit of study, perhaps shown again at midpoint of the unit in order to reemphasize salient points, or at the end as basis for review or even as part of the examination.

A film production unit in the audiovisual division of a large state university is experimenting with the production of a series of films designed for communication courses in any college or university. The films emphasize the flexibility of this medium, since the separate 30-minute productions are planned so that the entire reel may be used to present or to summarize a major concept, whereas semi-independent 5-minute segments, clearly identified by the makers and described in the accompanying instructor's manual, may be used as stimulants to discussion or research. The films are carefully planned to raise fundamental problems, and not simply to give the final answers for repetition at test time.

A very useful innovation in film usage has direct application to independent study. This is the 8mm cartridge-contained "single-concept" film loop. In this form, each film may last only 5 to 10 minutes; it can be checked out from the laboratory stockroom, or from the library, inserted by the student into the projector in a nearby carrel, and viewed as often as necessary. Commercial films of this type are available with sound. Simple and inexpensive local productions can provide a separate taped sound track; or a well staffed local instructional resources center can arrange for sound-on-film even of the locally produced prints. Uses of this device in sciences to demonstrate laboratory procedures or to present time-lapse sequences or microscopic views are apparent and exciting.

Interest in 8mm color films generated by the convenience and economy of 8mm cartridge projection is now receiving new impetus. Announcements by several manufacturers of a new 8mm "Super 8" format which provides superior picture quality, coupled with either magnetic or optical sound track systems, is one basis for this new interest. The new equipment and format promise to establish an entirely new cost level for use of films. For example, the new projectors are said to be capable of being sold to educational institutions at prices from one third to one half less than those of present 16mm sound projectors. Further, 8mm projectors are designed to provide a variety of technical improvements including self-threading, cartridge-contained films, small size, and light weight. Although the 8mm "Super 8" projectors are not designed for very large group instruction, they do project films effectively in standard classrooms. They are also suitable for independent study use by students in carrels or in libraries. Most of the new units permit the use of earphones as well as loudspeakers for transmitting sound. Through the convenience of having small film packages at reasonable cost conveniently available to classrooms and to self-instructional carrels the motion picture is likely to play an even more extensive role in teaching than before.

CASE DESCRIPTIONS

Subjective Learning
California State College at San Bernardino
Lucas G. Lawrence

Single-concept 8mm loop films are proving their effectiveness in the Natural Science and Physical Education Departments of California State College at San Bernardino. Playback of the Standard 8mm films is afforded by Technicolor loop projectors and a Kodak Standard 8/Super 8 machine.

Films currently in use have been acquired from commercial vendors. However, an instrumentation inventory is being composed which will allow the College to create and produce its own films, since experience has shown that commercial items frequently are too biased or too incomplete to suit specific instructional objectives.

The motion picture camera chosen is the exceptionally versatile "Scopic 16"" 16mm camera. Films will be produced in 16mm Kodachrome, to be reduction printed to 8mm Kodachrome. Copies of 8mm film

8mm "single concept" loop films, without sound tracks, provide supplementary individualized instruction in biology. (Oklahoma Christian College) will be spliced, end to end, for loop projection purposes. Since the "master negative" is of 16mm format, the production of Standard 8 prints (for Standard 8 loop projectors) or Super 8 prints (for Super 8 loop projectors) requires no dual format camera inventories.

Additional advantages reside in the fact that the 16mm camera can produce 24 fps sound synchronized motion pictures for 16mm projectors and lends itself to time-lapse photography of objects of scientific interest.

The motion picture production philosophy at San Bernardino has been designed to weigh the merits of films vs. slides. Films will be given preference over slides when the following requirements are to be met:

1. Action or motion must be presented.
2. Greater realism is needed than can be provided by other practical means of representation.
3. There is a need for bridging space and/or time.
4. The complex behavior of process conditions requires representation.
5. Dynamic microphysical processes need to be perceived, especially those dealing with certain biological phenomena.
6. Important corrective situations must be delineated.
7. Special relationships of dynamic vs. static states must be explained.
8. Complex happenings must be defined and repetitively reviewed.
9. A real-life experience must be simulated.

In all of the above, emphasis has been placed on dynamics and motion. If these fundamental mandates do not prevail, slides will be given preference over cinematographic-type presentations.

Use of Continuous Loop Films To Reinforce Technical Demonstrations in Vocational Education

College of Marin, Kentfield, California

Donald Robert Greenfield

One of the critical areas in presentation of curricular materials in the industrial arts and vocational education areas of both the secondary schools and junior colleges is the technical demonstration. The instructor is continually plagued by "learning problems" that are created when a technical demonstration is utilized. Once the theory of a concept has been presented to the class — including text assignment, discussion, etc. — and the class is ready for the demonstration, the following problems become manifest:

- How can 15 to 24 students clearly observe a demonstration when they must be crowded about a machine?
- The generally fairly short attention span of students, plus the youngsters' standing in a confined area cause the amount of retention to dwindle.
- There are always student absences as well as transfer students who arrive after the initial essential demonstrations are concluded.
- It is hard to ensure that the student is looking at the correct moving part, handwheel, or cutting action at the correct time.
- There is generally a time lag between actual demonstration and students' application of the information or skill, usually requiring the instructor practically to repeat the highlights of the demonstration for many students on an individual basis.
- Certain areas within the vocational curriculum pose hazardous problems, like welding and burning demonstrations as well as the pouring of hot metals, and even spray painting or demonstrations involving the use of chemicals.

What is needed is a means of showing a reproduction of the demonstration to reinforce the actual demonstration, one that is economical to produce and can be shown with relative ease. The projector should be operable by the student; the film should be one that may be retained by the individual instructor in the shop, that may be shown without darkening the room, and that does not require a screen.

Employing the single-loop concept, a demonstration may be photographed with an approximate shooting time of 5 to 10 hours. After the film is edited and processed, it is sounded using the narration technique. The film will cover only those principles and skills that the instructor feels are necessary. A 45-minute demonstration can, in this way, be condensed to a 10- or 12-minute film (in color). Close-ups direct students' attention to critical areas of the demonstration. Cartridges facilitate loading and unloading of the Fairchild projector without audiovisual training. Thus, in the event a student needs to refresh his memory, he can select the correct cartridge, install it in the projector, and then watch the demonstration in the school shop. In 10 minutes he is prepared to do the manipulative operation. Perhaps the best results may be obtained by first witnessing the actual demonstration — asking questions, etc. Next, the group would watch the film as a follow-up activity. The film is then available in the shop for student memory refreshment as it may be needed.

It is the investigator's thesis, based on preliminary research, that the single-loop concept will prove to be of significant help for the vocational instructors' daily teaching of manipulative skills; furthermore, that single-loop films may be produced by individual instructors within a school or by a team of school district vocational instructors at minimal cost. The greatest value of employing single-loop films in the vocational curriculum, however, may well prove to be their aid to the vocational education student in his mastery of manipulative skills.

Future plans for the development of the single-loop concept at the College of Marin include a series of films and a pilot study conducted at local high schools in order to more thoroughly evaluate the concept.

Self-Instruction in Audiovisual Equipment Operation

San Jose State College, San Jose, California

Richard B. Lewis

A miniature self-instructional system using 8mm cartridge films has been developed at San Jose State College and was initially applied in teaching audiovisual techniques. This method involves silent 3- to 4-minute films for the Technicolor projector used in rear screen viewing boxes, with accompanying information and direction sheets leading to immediate student practice of skills presented. This method has proven that for many "how-to-do-it" and informational topics college students can use media to learn successfully by themselves. The 8mm methods developed for audiovisual production and equipment operation techniques have been extended to teaching the operation of IBM keypunch machines, industrial arts woodshop and craft skills, use of advanced chemistry laboratory equipment, and occupational therapy practices.

New Developments in Teaching Dentistry

The University of Iowa, Iowa City

Lee W. Cochran

Two years ago the College of Dentistry, The University of Iowa, secured a grant from the U.S. Public Health Service to research the potential contribution of 8mm motion pictures to certain phases of dental instruction.

During the past 2 years, between 40 and 50 of these films have been produced by the Motion Picture Unit of the Audiovisual Center. Films were produced in 16mm color, then reduced to 8mm, with a magnetic sound track added in the Fairchild 8mm cartridge projector. Films are from 4 to 6 minutes in length. Junior dental students conduct patient care in a large 132-chair dental clinic. Nine projector stations with 8mm projectors are located in the clinic with prints of all available films. Students, while working with a patient in the clinic, can go to any of the projector stations, select a film that will show specific detailed instruction on the exact operation being performed, review the operation, and return to their patient and continue the work. Films have been produced in the fields of operative dentistry, crown and bridge prosthesis, and prosthetic dentistry. Another cartridge projector with a complete set of all film subjects is located in the dental library where students can go to review certain dental operations they will be performing in the immediate future.

Other new techniques being used in dentistry instruction include videotape recorders, a special TV studio room completely equipped for dental operations, and a laboratory equipped with an overhead closed-circuit TV camera for demonstrations of small models where large groups can watch the techniques being shown.

Development and Use of Stimulus Films in Teacher Education

University of Missouri at Kansas City and Indiana University, Bloomington

David Gliessman and Don G. Williams

The Inter-University Film Group has developed and is planning to produce a series of 20 problem-centered films for use in teacher education. Each of these films will portray a different teaching problem without offering a conclusion or solution to that problem. These "stimulus films" aim to stimulate thought and discussion. An *Instructor's Manual* and a *Student's Manual*, due to accompany the films, will include suggested ways of using the films, questions and exercises that provide "cues" to the psychologically significant aspects of each film, and references in educational psychology that are relevant to each film.

The basic purpose of the films is to provide students with an opportunity to make decisions in teaching on the basis of concepts and principles from the field of education, especially those from educational psychology.

In a joint utilization project at the University of Missouri at Kansas City and Indiana University, the five films already produced have been used in a rather unique fashion. Several sections of undergraduate educational psychology at each institution were designed around the use of the films and the accompanying materials. With the films themselves (or the scripts of unfinished films) as problem material, the students instructed themselves in small groups. The task of each group was to arrive at a psychologically defensible problem solution to several of the film problems and to prepare a brief written rationale for each solution. Since there is no single "correct" solution to the film problems, of course, the educational psychology course itself had a distinctly "open-ended flavor."

A unique feature of the development of this film series is the amount of pretesting that was involved. The problems to be filmed were initially selected on the basis of a survey of students, professors, and practicing teachers at all the member institutions of the Film Group. Criteria used for selection were degree of interest of the problem for students, realism of the problem, and meaningfulness of the problem in instruction. As the problems finally selected were being expanded into film scripts, they were used as stimuli for actual classroom discussion at the member institutions. The feedback from this discussion was then used to improve on the final scripts.

The Inter-University Film Group includes participants from the following colleges and universities: Clarion (Pennsylvania), Colorado, Florida, Indiana, Maryland, Missouri, Missouri at Kansas City, North Texas, Ohio State, Oswego, and Syracuse. The project has been based principally at the University of Missouri at Kansas City. It has had the support of the Teacher Education and Media Project, American Association of Colleges for Teacher Education. The pretesting, preparation of film scripts, and actual production of the first five films were supported by a series of Title VII contracts with the U.S. Office of Education.

Motion Pictures for Health Sciences Teaching

University of Washington, Seattle

Thomas A. Stebbins

Teaching and research-type motion pictures have been produced at the University of Washington since 1949 as media for illustrating and communicating many difficult and complex subjects.

The Department of Health Sciences Illustration has developed a staff and facilities to assist faculty in producing —

1. Short single-concept teaching films for graduate, continuing education, and patient education programs in the Division of Health Sciences;

2. Research films to record and communicate a wide variety of clinical and nonclinical visual data; and

3. Full-scale film productions such as our series on *Congenital Malformations of the Heart*, or such titles as *Ovulation and Egg Transport in the Rat*, *Structure and Function of the Vestibular Apparatus*, and *The Insertion and Removal of the Intra-Uterine Device (IUD)*.

Designed and produced from script to layout, live action and animation with sound and narration, the medium demands a continuing team effort of the artist, photographer, sound engineer, and author.

INSTITUTIONAL INVENTORY

Arizona State University, Tempe. In University-conducted workshops during 2 recent summers, teachers learned to produce acceptable self-instructional 8mm films. (John P. Vergis)

California State College at San Bernardino. Working to produce 8mm film loops in science and physical education. (Lucas G. Lawrence)

College of Marin, Kentfield, Calif. 8mm color-sound films prepared on campus are used in nursing (40 films planned), geology (films supplemented by self-instructional materials), and machine-metals technology. Other uses planned. A special individual study classroom with carrels is planned. (Donald R. Greenfield)

Eastern New Mexico University, Portales. Sound is added to film, and copy sheets, practice sheets, and laboratory materials are added to improve learning programs. (Herbert E. Humbert)

Indiana University, Bloomington. Inter-University Film Group is developing a series of 20 problem-centered films to stimulate discussion in teacher education. Five films have been produced, dealing primarily with educational psychology. (David Gliessman)

Johns Hopkins University, Baltimore, Md. Using experimental filmed lecture-demonstrations of outstanding scholars in undergraduate classes in art and fluid mechanics. (James C. Butler)

King's College, Wilkes-Barre, Pa. Planning production of 8mm film loops in chemistry, to be supplemented by written exercises and examinations. (Jay A. Young)

Middle Georgia College, Cochran. Commercially produced films and microfilms purchased for instructional use, and stored in library. (Eula Windham)

Ohio State University, Columbus. The "Single-Concept Film in the Field of Physics" has been completed and put into commercial distribution. Currently involved in exploring uses of short, fragment films in education, fine arts, and mathematics. (Robert W. Wagner)

Pennsylvania State University, University Park. American archive of Encyclopedia Cinematographica available for loan to other colleges and universities. Produces and uses 20 sound motion pictures to serve as demonstrations of good teaching and learning techniques as supplements to observations in secondary education methods classes. (L. P. Greenhill and Robert B. Patrick)

Polytechnic Institute of Brooklyn, New York, N.Y. Graphic presentation of computer output of mathematical equations is filmed for class use. A Stromberg-Carlson 4020 cathode ray tube recorder is driven by an IBM 7040 computer (or by magnetic tape generated on any computer). The tape can be processed onto film by the Institute, at cost. (L. Braun)

Purdue University, Lafayette, Ind. Films used in basic physics course as substitutes for some lectures in contrast to conventional presentations of lecture demonstrations. Regarded as having been successful. (D. J. Tendam)

Rensselaer Polytechnic Institute, Troy, N.Y. Now using "Animated Films To Facilitate Creative Space Perception" with pictures to teach two thirds of students in second course in graphics. (Harold G. Kinner)

San Jose State College, San Jose, Calif. 8mm cartridge films (supplemented by practice) have been produced to teach audiovisual equipment operation, IBM keypunch machine operation, woodshop and craft skills, use of chemistry laboratory equipment, and practices in occupational therapy. (Richard B. Lewis)

Stanford University, Stanford, Calif. Utilizes time-lapse photography in studies of attending behavior of students in teaching-learning situations. (Dwight Allen)

State University of New York (SUNY), College at Fredonia. 8mm loop films are used to teach clarinet fingering, embouchure, and hand position in music. Specifically designed films produced on campus. Some used for teaching recognition of tennis errors. (Robert M. Diamond and Thomas C. Collins)

SUNY, College at Oneonta. Videotapes of lectures put onto 8mm film (in economics), and experimental group views only these all semester. (F. Brooks Sanders)

University of California, San Francisco Medical Cen-

ter. Ingenious use of 8mm loops in physiology. (Irving R. Merrill)

University of California at Santa Cruz. Students (with Office of Instructional Services support) have produced single-concept films in physics; others planned as institution grows. (Marvin J. Rosen)

University of Colorado, Boulder. Film library of more than 6,000 prints; regular weekly program of previews to encourage utilization. (Louis Brown)

University of Houston, Houston, Tex. Psychology Department has produced 16mm sound film of well known scientists (psychology) for use in classes. (Richard I. Evans)

University of Iowa, Iowa City. Between 40 and 50 films have been produced by the Motion Picture Unit of the AV Center, in 16mm color, then reduced to 8mm, with magnetic sound track added. Junior dentistry students conduct patient care in a 132-chair dental clinic; and 9 projector stations with 8mm projectors are located there. (Lee W. Cochran)

University of Nevada, Reno. Rear projection single-concept 8mm for self-instruction in carrels. (Donald G. Potter)

University of North Carolina, Chapel Hill. Using 16mm motion picture films in freshman-sophomore English classes to provide additional background and biographical information, and as basis for writing assignments. (Kenneth M. McIntyre)

University of South Florida, Tampa. Series of filmstrips on tennis and golf included in the teaching laboratory to be used with audio portion of the lesson in an integrated program of student-paced learning and participation. (G. C. Eichholz)

University of Texas, Austin. 8mm sound cameras and projectors used in teacher education to show students specific nature of their performance and ability to relate with pupils. Feedback to the students includes presence of supervisor and an educational psychologist. Also employed to a limited extent in counselor training. (Benjamin Holland)

University of Washington, Seattle. Filmed clinical materials are being exhibited as portions of objective, multiple-choice standardized medical examinations. Professional films are shown for voluntary attendance by students and staff in nursing, dentistry, and medicine; 12 short films with sound in pharmacology, each supplemented by linear programed material. (Boyd Baldwin)

SUMMARY

In the course of the visits to campuses for the HEMS study, the editors found that faculty members who were using or producing films for instructional use uniformly felt that the values of both 16mm and 8mm films had not yet been fully realized, even after 40 years; that they still can serve some instructional functions more economically and conveniently than other, newer media; and that new uses and combinations of uses of film with other new media remain to be discovered. This conclusion is emphasized by the practice of institutions with advanced closed-circuit TV equipment in transferring valuable videotape to film for storage and for extended use, especially for use on other campuses.

V

LISTENING LABORATORIES AND AUDIOTAPES

THE listening laboratory is perhaps the most successful and widely used of the many new media now available to higher education. More respondents to the HEMS inventory reported activity in television and in computer-assisted instruction; but our instructions asked for "innovative" uses, and several of the respondents mentioned that they were using listening laboratories "only in the conventional ways." It seems reasonable to estimate that a majority of colleges have at least a minimal language listening facility for instructional use.

The audiotape is the basic medium of all listening laboratories. While a few laboratories in institutions of higher learning around the country appeared to be making uneconomical (although admittedly experimental) uses of videotapes to provide what essentially seems to be an "audio" experience, this practice was not common.

The simplicity and convenience of using, reproducing, or duplicating audiotapes make them ideal elements for various self-instructional programs. In language and music study, for example, the multitrack tape permits the recording and erasing of student responses for testing or instructional purposes without in any way damaging the original instructional recording. Use of tape for language drills (and in English grammar, shorthand, and other class activities) also helps to free instructors for other more creative or individualized instructional tasks. The recent development of high-speed tape duplication equipment (activated by remote dial facilities) now provides students or instructors with random access to entire banks of master tapes with minimum delays — a highly important technical breakthrough for instruction. Instructor experience with audiotapes has led to many promising experiments in combining instructional uses of tapes with such other media as slides, printed programed learning units, and various forms of computer-assisted instruction.

The conventional college listening laboratory is a facility for the study of foreign languages. It is a self-contained suite, including a control room, a recording studio, and a classroom. The classroom contains, typically, from 24 to 60 student booths, each equipped with a tape recorder capable of duplicating, playback, listen/record, and audio-lingual testing. The teacher's console (control) allows for recording of student responses, monitoring of student responses, testing, correcting of student responses, instructions to one or to all student stations, and dissemination of several different exercises to different stations simultaneously. The recording studio is ordinarily an acoustically treated room with provision for teacher preparation of monaural or stereo tapes, rapid reproduction of master tapes, and individual or small-group audition of tapes. The language laboratory is used both for class instruction and drill in unison and for individual study. Usually the student can check out a tape from the language tape library and listen to it at a time convenient to him. Sometimes the tape may be taken from the building to be played on the student's own player, but this privilege is rarely granted in the larger colleges and universities.

A more recent adaptation of the listening laboratory is the random-access system. Under this arrangement, the same types of recording facilities are used; if class instruction in language is included in the functions of the laboratory, at least some of the carrels must be grouped in a single room and controlled from the teacher's console in much the same way as in the conventional language laboratory. However, the random-access facility emphasizes individual study. The tape deck is removed from the carrel; in its place appears a dial similar to the telephone dial, plus the usual earphones. The reproducing system involves a special-purpose digital computer, crossbar switches similar to those used in telephone systems, and a program room containing tape transports, timers, and program amplifiers for each tape transport (player-recorder). When a student dials the number assigned to the instructional segment he desires to hear, he is immediately connected with the tape transport carrying that lesson. At this point, several eventualities are possible. If he is the only student desiring that program at that moment, the tape transport starts, plays to the end, stops, rewinds, and is ready for another call; if another student is already on the line, the tape continues to its end and automatically rewinds and replays until there is no active demand for it. In most disciplines only a short segment (2 to 15 minutes) is recorded on any single tape. Longer exercises are usually divided over two or three call numbers. As many as 1,000 students may be listening to the same tape at one time without overtaxing the amplifier system or jamming the access system.

For lessons which do not lend themselves to fragmentation, such as symphonies or plays or lectures, the tape transport is programed to begin at a given time throughout the day, perhaps 5 minutes after the hour. Large numbers of students may dial in just before that time and hear the entire selection. A further refinement of random access has overcome the difficulty of extended waiting. By use of high-speed duplication and intermediate tapes, it is possible for a master tape to be reproduced in only a minute or two for hearing at any carrel.

Random access also has made it possible to bring much instruction directly into the living quarters of students. Carrels may be installed also in the library, in other classroom buildings, in fraternities and sororities, and in dormitories, so that the student need not travel to the laboratory and, perhaps, wait until a carrel is free for his use. One college is designing its on-campus audio distribution system in cooperation with the local telephone company so that it may later be possible for a person to dial into the college system from his home to obtain lesson assignments or materials.

Still another use of listening laboratories, found in only a few colleges, enables students to review lectures or to hear missed lectures. The professor prepares a tape at his regularly scheduled lecture and files the tapes and the visuals he used during the lecture in the library or listening laboratory. Any student, with a little more trouble than dialing, can then check out the tape, the visuals, and a tape recorder and hear the lecture he missed. One college provides this service for lectures that are videotaped on campus; an audiotape and slides of the visuals are made simultaneously with the videotape for individual student use. A future possibility for the listening laboratory (now quite rare, but available) is that the student terminals will be equipped also for the reception of a video signal when that is truly necessary and appropriate for the learning task. The ultimate development of this application is found at one independent college in which a carrel is rented to each student as his own study place; the carrels are situated in the Learning-Resources Center and have random access to audio tapes, as well as space for books, typewriter, slide or 8mm motion picture projection, and for eventual installation of a video screen. This facility seems to be a very promising and adaptable application of the principles of independent study and random-access information, not only in languages, but in a variety of disciplines.

In addition to its use as part of multimedia presentations and in listening laboratories, the ordinary audio recording has several other interesting instructional uses in certain more specialized fields. In medicine, for example, an instructor requires surgical students to study the literature on an assigned topic and then discuss the topic for 45 minutes, the discussion being taped; the instructor is not present during this session. The instructor then listens to the tape and makes notes of points that need clarification or have been overlooked in the discussion. In a later session with the students he can raise these specific points. In effect, the process serves as an oral diagnostic pretest, enabling the instructor to emphasize in his discussion the topics that the students do not fully understand. In another case, a speech instructor may have his students record their assigned speeches on one track of a dual-track tape, while he sits at the back of the room with a microphone and records his comments on the second track as the speech is delivered. His comments to the class at the conclusion of each speech are also recorded. The student then listens to a stereo replay of the tape, so that he can hear not only himself, but also the comments of the instructor.

CASE DESCRIPTIONS

Listening Facilities
College of San Mateo, San Mateo, California
John B. Dooley

The listening and language laboratory facilities of the College of San Mateo are components of the total library system and are housed on the lower floor of the library building.

A total of 218 student listening positions receive signals from 28 sources in a control room. The Ampex equipment (modified 1200's and QRK turntables) also includes three PR-10's for special tape-recording tasks. An FM tuner is connected through the control panel to facilitate taping programs off the air, and an Ampex tape duplicator, master and slave units, complete the list of equipment in the control room. The language laboratory facility is made up of laboratory booths, again with Ampex tape recorders (E-65's and others).

Two faculty recording studios house tape decks nd record players with accompanying speakers and icrophones for use in making master tapes.

The language laboratories are operated almost exclusively by the individual students after a 1-hour rientation lecture and demonstration by the librarian n charge. Students sign in and out of the booths on ndividual IBM cards filed at the laboratories. Weekly nd monthly print-outs give cumulative totals of student listening hours by course, class section, and student.

As the need arises, several program sources are reserved for lessons or programs which are repeated (semi-automatically) all day long at the same listening stations.

All areas of the curriculum are represented in addition to foreign languages, but special emphasis is placed on music and music appreciation, public speaking, shorthand dictation, political science, and drama. Lectures and programs of the campus-wide community education series are taped by the audiovisual division of the library, and these tapes are forwarded to audio for listening use. Special FM programs are taped off-the-air for use at more convenient times.

The thousands of disk recordings on file may be checked out by faculty and students for either home use or library use.

Some faculty members are beginning to make interesting and unique contributions to the program, an example being the architecture instructor who tapes at home his criticisms and comments on the drawings and plates of his students and directs the students to the listening facility to hear his personal remarks about their works.

In the year 1965-66, more than 37,500 student listening hours were spent in the listening program, and more than 10,600 student hours were clocked in the language laboratory facilities.

Utilizing Listening Stations for Blind Students

Fresno State College, Fresno, California

Leonard H. Bathurst, Jr.

The services provided by the Instructional Media Center at Fresno State College to staff members from the various instructional and related units on campus include some unique prototype materials and devices created to satisfy specific instructional needs.

A major factor which contributes significantly to the effectiveness of the service unit is the interdisciplinary cooperative spirit illustrated by faculty and staff of the College.

This report illustrates a typical action initiated and implemented through cooperative utilization of campus, community, and state resources.

During the summer months of 1965 it was brought out that blind students on campus did not have adequate means or facilities to take advantage of the educational opportunities available. More specifically:

- There was lack of (a) a designated area in which students could listen to recordings of textbooks and other readings; (b) room facilities or equipment for students who desired "readers" to record assigned materials; and (c) a recording library containing assigned readings so that the blind students could keep pace with other students.
- Less than desirable recording and listening conditions frequently existed in students' living quarters.
- Prerecorded texts and related materials for use on a loan basis, as well as duplicate copies of selected recordings, were not readily available.
- Standardized recording and playback equipment was not available.
- The carrying of recording equipment across campus by blind students was undesirable, if not impossible.
- Maximum utilization of equipment, in spite of careful planning, was usually impossible, and students often found it necessary to delay reading or listening because equipment wa[illegible]vailable.

As a means of eliminating the p[illegible]lems stated, the following procedures are presently employed:

- Individual preview-audition rooms located in the Instructional Media Center are made available to blind students and their "readers."
- Storage areas for student-owned magnetic tape recordings are assigned in the reception area.
- Students are taught to operate the College-owned magnetic tape recorders.
- Students utilizing the recording rooms are assigned a specific room when they enter the Center and are provided assistance on request.

As a direct result of this expanded function of the Center, the staff and faculty have developed a greater awareness and appreciation of the problems of blind students.

The following additional service activities have been developed and incorporated into the program:

- Approximately 400 recordings owned by the College and housed in the Center are available for student use.
- Recordings are duplicated in the sound recording studio when requested by blind students or their professors.
- Materials are made available to the Society for the Blind, the Department of Vocational Rehabilitation, and other agencies that provide recordings for the blind.
- Through the efforts of the Graduate Department of the Division of Social Work at Fresno State College, working with various agencies, more than 180 recordings have been duplicated and added to the tape depository of the Instructional Media Center for utilization by students and faculty.
- A remedial program which permits blind students to borrow recordings to take home during semester and summer breaks has provided some students with the desired materials necessary for improved learning.

Some other related activities being employed in the aural-oral learning facilities of the Center are as follows:

- Facilities are being used by a "reader" who records books on tape for the Library of Congress.
- Duplicate copies of loaned "books" are made available through the service unit now in operation.
- Foreign language professors and students learning English as a second language can record specific materials to satisfy specific needs.
- Professors of history are recording their lectures for evaluation and transcription purposes.

Modern Language Laboratory

Gannon College, Erie, Pennsylvania

Paul W. Peterson

Since the installation of the first language laboratory at Gannon College some 13 years ago, the director and staff have felt the lack of acceptable methods of presentation of visual teaching aids in conjunction with audio programs. Use of a reflecting-type screen necessitated extinguishing all illumination. Also, heat generated by projector bulbs and blower and motor noises of projection equipment constituted a perennial nuisance. When an opportunity presented itself, therefore, of designing a new laboratory in 1964, provision of adequate projection facilities was a prime consideration.

To house the projected laboratory, the Modern Language Department was granted a large classroom with a smaller classroom adjacent, and the design was accommodated to this floor plan. An aperture was cut in the wall between the two classrooms, in which a rear projection screen was mounted. Projection equipment was mounted below the screen. A projection tunnel was built behind the screen, and lined with light-absorbing fiber panels which were also sound absorbing and designed with nonparallel walls, further minimizing the problem of echo; the tunnel therefore served admirably in a second function as a recording studio. The space was vented to discharge heat generated by projection equipment, and blower noises were effectively muffled by the acoustic panels. This arrangement proved very satisfactory for projecting slides and filmstrips as well as motion picture films.

In the larger classroom a console fitted with four master tape decks, a turntable, and an input from a shortwave radio was installed with appropriate switching and monitoring controls. The 40 student booths were arranged in a chevron deployment so as to maintain adequate sight lines from each position to the screen. These booths were fitted with Webster Electric tape decks, transistorized amplifiers, and padded headphones with a boom microphone. The rear projection screen proved so effective that a satisfactory contrast could be obtained with full

The language laboratory control console at Illinois Teachers College, Chicago North, provides easy intercommunication between instructor and students.

lassroom illumination in the laboratory. To provide aximum versatility, a blackboard suspended from racks was installed, thus giving the instructor the hoice of screen, blackboard or maps, and other raphics mounted on cork panels affixed to the blackoard frame. Since the screen and blackboard were ositioned somewhat higher than eye level for maximum visibility by students, a platform fitted with a ectern was provided for instructors who might be presenting illustrated lectures in the laboratory.

A final refinement in this system was incorporation of techniques for synchronizing master tapes with visuals, either slides or filmstrips. This was accomplished by means of a Kodak Mark I Cavalcade programmer — an electronic relay device which automatically changes slides or advances filmstrips in response to an acoustic cue recorded on the master tape. A stereo master tape deck was installed in the console with a separate track provided for the acoustic cues so as to isolate the voice track from the cue track. The programs used in this system were prepared locally in the following manner: Some 20 to 50 slides from the departmental collection were selected to develop a set theme and were placed in their proper sequence on a slide viewing panel. A scenario describing the locale or situations depicted by the slides was prepared in the form of a dialogue between two or more speakers. This script was then recorded on tape with proper sound effects and background music. The slides were then placed in their proper sequence in a carousel drum magazine and the master tape threaded onto the stereo tape recorder with the upper track in the play mode and the lower (cue) track in the record mode. The output jack from the Kodak programmer was then inserted into the input jack of the lower deck and a 6500 MHz acoustic cue recorded on this lower track at proper intervals for slide change. For classroom operation the tape thus prepared was played on the console stereo tape deck with the voice track channeled through students' headphones and the cue track into the programmer for automatic synchronization of slides with the tape. Precisely the same technique for synchronization of filmstrips with tapes was used with the exception that the output from the programmer was fed into a Graflex filmstrip projector fitted with remote operating controls.

The Langston University Learning Center
Langston University, Langston, Oklahoma
Mamie Slothower

The Langston University Learning Center will be unique in that its focus will be on freshman students. Many students, though potentially capable of successful college performance, come from family backgrounds which have been unable to provide either the amount or the quality of enriching experiences considered minimal in our society. Langston University is striving to provide an environment for the inspiration and development of these young people.

The institution also recognizes its obligation to strengthen and push forward the intellectual and cultural development of those students whose behavior patterns were formed in a more privileged environment and whose performance is high as measured by any standard.

At a time when the major emphasis in higher education is on expanding graduate education and research, there is a tendency toward neglecting the undergraduate program, and more specifically the freshman program. With this knowledge in mind Langston University has accepted the challenge to upgrade its program by beginning with the freshman class.

The Learning Center is seen as a means of supplementing and enhancing the work of the teachers, not as a substitute for them.

The remote audio system will be used at Langston University. In the beginning there will be approximately 450 carrels, each equipped as a complete study center with book lockers, desks, typing table, and random-access tape system. The types of activity a student may pursue in his carrel fall into three categories: (a) conventional study, (b) listening activities, and (c) viewing and recording.

The tape workbook method will be used. Audiotapes alone would not sustain interest for anything like a full class period, nor would they provide for a means of visual demonstration to supplement the audio message. When, however, a workbook is designed to accompany the audiotape, the visual aspect can be provided for both clarity and interest. The workbook can present any visual material which the teacher might wish to use along with the recorded material: charts, graphs, drawings, photographs, maps, text of literature or speeches, or even short readings to be done during silent periods on the tape.

Initially the programed materials will be for general education. Tapes and workbooks are being prepared in language arts, biology, physical education, mathematics, American history, American government, and social institutions.

Provisions for flexibility and expansion are incorporated in the overall plan for the Learning Center. Eventually the entire curriculum will be associated with the Center.

The Listening Center at the Ohio State University
Columbus

The Listening Center is an audio adjunct to classroom instruction. Its services, available to any department of the University, are regularly used by departments of foreign languages and of English and speech, the Linguistics Division, the College of Education, and the School of Music.

The facilities also are used for such special functions as summer institutes in foreign languages and music, testing speech and hearing of incoming freshman students, testing foreign language proficiency, and foreign language training in conjunction with the Peace Corps.

The Center itself provides 149 student booths plus a large number of additional booths in strategic areas throughout the campus — the main library, the student union, student dormitories, and several classroom buildings. The student selects a program by dialing a three-digit number from a dial in the booth; the connection is virtually instantaneous, and the fidelity is of high quality. Many booths are equipped for "audio-active" listening, in which the student hears his pronunciation amplified through his headphone-microphone set for effective comparison with the native model.

Individual tape recorders are designed so that students can listen to prerecorded exercises and record their responses on individual tapes. There are presently 8,000 such individual tapes used in conjunction with courses in foreign languages, linguistics, speech, education, music, and English.

Special equipment is on hand for testing speaking proficiency; 32 testing booths and a master console enable instructors to give oral tests, either live or prerecorded. The students' responses are recorded remotely, under the control of the tester, who also can monitor and communicate with the students in any of the testing booths.

The Center provides technical assistance in recording and editing master tapes, pedagogical advice on preparing recorded material and integrating it with class work, and help in construction and administration of tests. It also engages in original research on programed instruction, applied linguistics, language testing, and psychology of language learning.

An Audio-Video System

Oral Roberts University, Tulsa, Oklahoma
Paul I. McClendon

Basically, the system is designed to provide for —

- Production of original audio and video programed materials as well as correlation of existing materials.
- Storage of audio and video materials on source origination equipment.
- Distribution of the stored materials to remote station locations.
- Retrieval by random-access and audio-video display of any stored materials from any remote station under 100 percent use conditions.

Production facilities for the system comprise standard TV studio, TV audio, master control, and tape and film rooms; studio vidicons plus table-top overhead vidicon cameras; two stereo-equipped audio control rooms. Quadruplex videotape machines are used. A separate science laboratory closed-circuit loop allows local display of table-top dissections and experiments and microscopic materials which may also be videotaped or fed live through the production center into the dial system. Another production tool is a specially designed tuned frequency controlled programmer for film chains with which slides, filmclips, and videotape clips can be "programed" with lectures and other audio sources into an integrated presentation. Upon completion, presentation will automatically recycle at a dial request following the tuned frequency pulse code signals. This provides an audio-video program without using the TV production studio facilities. A performance analysis studio permits audio-video programed instruction with provision for audio and videotape responses for comparative analysis.

Audio storage is effected on audiotape transports equipped with photo sensing captive control modifications to automatically recycle at the program end or when the last listener hangs up. Two radio tuners are provided for broadcast. Audio programs also may be continuously cycled, clock or manual starter. Video (with audio) storage is provided through three quadruplex videotape machines, six film chains, five programmers (described above), four live cameras, and two TV tuners for broadcast.

Distribution is made to 130 stations located throughout the Learning Resources Center including each classroom, nests of audio-video carrels in the library, a bank of audio-video carrels in a learning laboratory, and audio-only dial terminations coinciding as an extra feature with each position in a 30-station language laboratory. Video distribution is used to all locations; no RF multiplexing is employed.

Retrieval is achieved through combination of a computer with crossbar audio and solid state video switching matrices operating to connect the source materials and equipment to the calling station in response to the digital dialed code.

To date, the system has been employed by faculty members in all of the sciences and liberal arts as supplementary means of instruction. Preliminary results indicate high student motivation; accommodation of individual student differences for rate, depth, and scope of learning; convenience of preview and review; ease of updating courses with latest current materials; increased opportunity for application and integration. Experimentation is being planned also for using the system for self-teaching.

The Language Learning Center

St. Joseph College, Emmitsburg, Maryland
Sister Margaret Flinton

The Language Learning Center at St. Joseph College comprises —

1. A 56-position RCA Model EDC-101 laboratory equipped with (a) microphone headsets; (b) student tape decks; (c) control console having one to six program sources; (d) permanently installed 16mm film, filmstrip, and slide projectors; (e) five individual viewing booths for slides and filmstrips;
2. A Master recording studio;
3. A 10-position simultaneous interpretation unit utilizing an EFI wireless learning system;
4. Audio notebooks;
5. A 3M visual communication unit;
6. A 12-position Webster Electric mobile teaching laboratory.

In order to stimulate interest in the field of interpretation and translation, the Department of Modern Languages and Literatures of St. Joseph College has undertaken experimental work in simultaneous interpretation on a noncredit basis. This training, offered to senior language majors, demands intensive oral practice and provides additional cultural enrichment.

No electrical wiring has been required for the simultaneous interpretation unit. A "learning loop" forms a circle of inaudible signals around the walls, thus acting as antenna for the output of any audio device. A three-channel consolette receives the input of three translators' microphones. The "live voice" clarity of the latter eliminates the need of isolated booths for the translators whose work is done in whispered tones.

Students who are listening to the translators wear lightweight listening devices. They may select the language of their choice from any one of the three channels on their individual wireless battery-powered receiver. The present 10-position simultaneous interpretation unit can accommodate 20 students.

Other experimental work is in progress with upper-level language students. A project that is stimulating extensive reading and concentrated study of literary works is the preparation of original cultural and literary transparencies for seminar discussions.

Individual and small-group viewers permit synchronized audiovisual review and increased opportunities for independent study.

Plans for the future development of the St. Joseph College Language Learning Center include additional materials in Western languages, introductory programed courses in non-Western languages and cultures, and audiovisual materials in the teaching of English as a foreign language.

Proposed Multipurpose Learning Laboratory for San Bernardino Valley College

San Bernardino, California

James M. Yurkunski

A multipurpose learning laboratory is being developed at San Bernardino Valley College which can fulfill the needs of an ever-growing foreign language department as well as many requirements of the other disciplines of the College. The laboratory will include, in addition to the normal listen-respond-record/playback functions, closed-circuit video presentation of prerecorded TV instructional material. It is felt that these functions will make the laboratory a learning device limited only by the ingenuity of the faculty.

The laboratory is designed to accommodate 120 students in 15 circular units. Each student position will be equipped for full level TV (listen-respond-record/playback-video) facility. All program source equipment and student record equipment will be housed in the master control area, leaving only the necessary dial system, audio and video controls, video screen, and headset for audio reception in the student position.

Program material for the audio function of the multipurpose learning laboratory will be provided by ten 32-track, 1-inch magnetic tape memory bank units, each capable of providing programs of maximum 30-minute duration at 3¾ ips. The unique feature of the random-access system is that when a student dials for a particular lesson stored in one of the memory banks, the switching logic (a small, specialized computer) puts his individual recorder in contact with the appropriate signal and records it at 60 ips. Once the lesson is recorded for the student (a matter of some 2 minutes maximum copy time), the memory bank is free to provide lessons for any other student. The student may listen to his lesson, record his own voice along with it, and play back one or both tracks as many times as he wishes.

The video function of the multipurpose learning laboratory is seen as having a high potential in supplementing courses already offered by television on this campus. Courses in political science, biology, and hygiene already have been developed and will be available to students via the closed-circuit video channels of the laboratory. It is felt that many disciplines not at present employing television will develop material which can be presented most effectively by this medium. All closed-circuit TV lesson material will be stored on 1-inch videotapes in programs of 30-minute maximum duration and will be available to the student by his calling the master control and requesting the specific lesson which would then be sent him over one of the 10 proposed TV circuits.

In addition to the above facilities, two complete recording studios (to accommodate a maximum of 10 to 12 persons each) will be provided, with facilities for full-scale audio recording and limited (small camera, monochrome) TV taping.

The multipurpose learning laboratory has an extremely high potential as a learning device for any subject matter taught on this campus, ranging from a full-scale technical training program (automotive mechanics, machine shop, aircraft mechanics, refrigeration, electronics, etc.) through a highly academic program (English, physical science, art, music, foreign language, mathematics, humanities, life science, etc.). It has also been determined that the system is compatible to operation in conjunction with a computer, thus allowing for an even broader ultimate program.

As the College continues its program of growth toward the development of satellite campuses, the need of providing them with these same multipurpose learning facilities probably will be met by use of microwave broadcast or telephone lease-line for all subject material from the central campus laboratory.

Closed-Circuit Instructional Radio: Some Proposals

University of Missouri at Kansas City

Sam Scott

The University of Missouri at Kansas City proposes to broadcast instructional, informational, and refer-

An instructor at the control center of the language laboratory in Oakland Community College (Bloomfield Hills, Michigan) prepares a tape for student use.

ence type materials on closed-circuit radio by utilizing the two SCA (Subsidiary Communications Authorization) multiplex channels of the University radio station, KCUR-FM.

Programs broadcast on SCA multiplex channels cannot be heard on regular FM radios, but only on receivers specifically tuned to the frequency of transmission, generally 41 kc and 67 kc. Material cannot be transmitted on the SCA multiplex channels unless the radio station is simultaneously broadcasting a general program service on its main channel.

Listening centers will be established in a number of locations both on and off campus — the library, student center, dormitory, classrooms, lounges, etc. — some equipped with receivers specifically tuned to pick up programs broadcast on the 41 kc SCA channel, and others with receivers tuned to 67 kc. Then, while KCUR-FM is broadcasting a program of news analysis on the main channel, which can be heard on any regular FM radio within the station's coverage area, it is simultaneously broadcasting a world history lecture, tape recorded during an earlier class period, on the 41 kc SCA channel, and pretaped intermediate French language drills on the 67 kc SCA channel.

Printed program schedules will be distributed each week indicating program content, time of broadcast, and location of listening centers where each can be heard. By utilizing the two SCA multiplex channels in the manner described for only 5 hours a day, the University will be able to provide 10 hours of supplementary instructional service per day for the benefit and convenience of students.

It should be pointed out that the number of listening centers need be limited only by the availability of suitable rooms within the service or coverage area of the radio station. UMKC, as an urban university, has a large and diversified program in continuing education. It has been suggested that listening centers be established in towns and communities within a 30- to 40-mile radius of the campus. Interested persons could then enroll in courses in continuing education and hear the lectures and discussions without driving long distances to the campus. They could participate in the question-answer, discussion period by placing a telephone call which would be amplified and heard by all groups in the various locations.

Similarly, short courses, refresher courses, and seminars sponsored by the various professional schools could be broadcast on one of the SCA multiplex channels on weekends, and busy professional people in surrounding towns and communities could be kept abreast of new techniques, concepts, or developments in their various fields.

Highly specialized courses given by outstanding or uniquely qualified professors might be broadcast on a multiplex channel to other colleges and universities within the same radius. Students could enroll in the course and receive credit from their own institutions, with discussions and exams supervised by a proctor. SCA multiplex receivers could be installed in area high schools, and students in accelerated programs could listen to college-level lectures in various disciplines.

Numerous additional specialized applications might be mentioned. Specific enrichment or instructional sequences could be produced on contract for transmission to listening centers in culturally and economically deprived areas to supplement such programs as Upward Bound, VISTA, Head Start, and others, for the intellectual nourishment of children and adults alike. Special curriculums might be developed for transmission to various institutions to aid in the education and/or rehabilitation of prison inmates or hospital patients. Special "packages" for training, informational, or cultural purposes could be tailored on request for use by industry, military installations, governmental agencies, etc.

Closed-circuit radio by SCA multiplex seems to offer a versatile, flexible, efficient, and economical method for the distribution of instructional, informational, and reference type materials and should become another valuable educational tool. Where visual materials are not required or are seldom used, closed-circuit radio should be able to do the job just as well as — and at far less cost than — closed-circuit television.

A Teaching-Learning Laboratory in Use

University of South Florida, Tampa
G. C. Eichholz

In 1960 when the University of South Florida opened its doors for the first time, three innovations were begun relating directly to the use of a teaching-learning laboratory.

1. All major lectures on the University campus were recorded and made available to students in the laboratory.
2. A variety of materials (other than foreign languages) were made available. Some of these materials consisted of a complete set of shorthand tapes at varying speeds of dictation, required music and drama experiences, and exercises in articulation for speech students.
3. A series of filmstrips on tennis and golf was included in the laboratory to be used along with the audio portion of the lesson in an integrated program of student-paced learning and participating.

These three programs are still in existence today. More specifically:

- The major lectures recorded are still being used and, in some cases, assigned as reference listening as a part of a course bibliography. The tape lectures have been used in place of attendance in class where schedule conflicts and/or physical disabilities made class attendance impossible. Their availability has led faculty members to use in their lectures portions of 2-, and 3-, and sometimes 4-year-old lectures by another professor because of their appropriateness and illustrative value.

  The collection has grown so large that department chairmen are asked to review the tape lectures of their departments at the end of each year and to suggest how long each tape should be kept.
- The use of the Teaching-Audio Laboratory has been growing as the enrollment and course offerings within the University increase, providing the following: music listening, drama, shorthand, recordings of special speakers on campus, student recordings for some sociology classes and many other disciplines. With the installation of an audio-video learning center random access will be available to 150 positions. The system will be consistent with local telephone equipment and will make the audio portion of the laboratory available to any telephone in the Tampa bay area. The system also will be expanded on campus (both audio and video) to include all classrooms, auditoriums, and specific locations within dormitories.
- The teaching of certain physical education proficiencies through the use of filmstrips and tapes in the audio laboratory has been continued. Certain activities have been replaced with 30-minute TV lessons shown both on the University's closed-circuit system as well as over the air.

The University of South Florida continues to find ever-increasing needs for the use of a large variety of media to implement instruction. Experimentation in the more effective use of media continues. The Division of Educational Resources, an all-university service responsible for all media and equipment, will be expanded this year to approximately 48 full-time people, 100 part-time people (including student assistants), and a budget of approximately $400,000. This growth (in 7 years) is a reflection of faculty commitment to the extensive use of media in their instructional program.

INSTITUTIONAL INVENTORY

Augustana College, Sioux Falls, S. Dak. Conventional listening laboratory in foreign language department uses 30 booths with 2 tape channels and 1 disk source; 5 can record students. (Gerhard M. Schmutterer)

Bowdoin College, Brunswick, Maine. Students check out tapes (library made) and listen at their own speed and at their own convenience in one of 28 booths. Facility also can be used for entire classes. (James A. Storer)

California State College at Hayward. Two-classroom laboratory in foreign languages allows either remote access by dial or manual tape deck operation; computerized attendance records printed out for instructors quarterly. (Arthur S. Kimmel)

Clark College, Vancouver, Wash. Reading instructor tapes instruction for adult illiterates at several levels of difficulty and works with individuals while remainder work with the taped instruction. (Delmar V. Harris)

Clark University, Worcester, Mass. Dial-access language lab being made available to public schools. (Raymond E. Barbera)

College of Holy Names, Oakland, Calif. Has 28 language lab positions and 6 library positions, carrying 5 languages; students scheduled individually; 2 elementary language classrooms with several program sources and CCTV reception. (Sister Mary Anselm Grover)

College of St. Benedict, St. Joseph, Minn. Five-program console; 25 positions; audio-active; tapes issued to students for use in carrels (library made). (Sister Margretta Nathe, O.S.B.)

College of San Mateo, San Mateo, Calif. Has 218 stations with 28 program sources, not dial, but some courses are assigned to specific stations. Instructors tape criticisms of student composition or laboratory projects, and students hear them in listening lab. (John B. Dooley)

College of the Sequoias, Visalia, Calif. Dial-retrieval system consists of 62 listening stations, switching equipment capable of handling 70 dials and 120 program sources; a central repository provides 28 four-track tape players, 10 student demand recorders, 1 student test unit with dubbing facilities, and a soundproof recording room. (M. Grumbling)

Connecticut College, New London. Has 45-position random-access laboratory permitting students at all levels of 6 languages taught to use equipment simultaneously within limits of seating capacity. (James H. Williston)

Fort Lewis College, Durango, Colo. Audio-active-record language lab, console and 15 stations, 24 planned. Library use most frequent. (Kenneth I. Periman)

Fresno State College, Fresno, Calif. Use of listening stations for blind students, and accumulation of current lecture tapes and a permanent collection of instructional recordings for them. (Leonard H. Bathurst, Jr.)

Gannon College, Erie, Pa. Devised a mirror-plus-projection-tunnel system for rear projection onto plastic screen in front of large classroom, so as to have visuals in language laboratory. Four master tape decks, record player, and radio input are connected to 40 booths. Master tapes can be synchronized to visuals. (Paul W. Peterson)

Green Mountain College, Poultney, Vt. Has 20 carrels, 2 with tape recorders, 18 wired to 18 master players in cabinet. Students scheduled individually. (Lawrence W. Boothby)

Hahnemann Medical College, Philadelphia, Pa. General Surgery students discuss seminar topics for 45 minutes by themselves; discussion is taped; instructors listen to tape and comments and enlarge on them in later seminar sessions. (Edward D. Coppola, M.D.)

Illinois Wesleyan University, Bloomington. Random-access communications center with plans for carrels in dorms and library. (Everette L. Walker)

Junior College District of St. Louis—St. Louis County, St. Louis, Mo. Dial-access audio is keyed to a slide viewer in art appreciation; provides dictation in stenography, literature readings in English, foreign language drill, library instruction, music appreciation lessons. (David Underwood)

Keystone Junior College, La Plume, Pa. Audio-active-record language laboratory with 5 program sources, 32 student stations. Tape recorders in booths permit students to record lesson and their own responses for later home listening. (Marko Zuzic)

La Grange College, La Grange, Ga. Uses disks in literature, to allow students to hear contemporary recordings of drama, poetry, other readings. (Walter D. Jones)

Langston University, Langston, Okla. Langston University Learning Center focuses at present on freshmen, providing individual carrels equipped with all the resources needed for almost any type of study. (Mamie Slothower)

Los Angeles Valley College, Van Nuys, Calif. New facility (1967) provides 100 channels and 144 listening positions, supplemented by carrels in Study Skills Center and in Library. (Kermit Dale)

Middle Georgia College, Cochran. Laboratory consists of 30 listening stations and a console with 2 tape decks, record player, and stereo tape recorder. (Gerald Townsend)

Middlebury College, Middlebury, Vt. Sound-insulated practice carrels are reserved by students for language study. Students control pace themselves by having 1 recorder for playback and 1 for their responses. System is operated entirely by the student himself, independently. (James M. Watkins)

Northwestern University, Evanston, Ill. Has 8-program laboratory used in 5 languages. Communications Research Laboratory in Speech permits audio recordings to be made of activities in an experimental room, observed through one-way mirror. Videotaping planned. (Charles F. Hunter)

Ohio State University, Columbus. The Listening Center has 149 student booths, plus a large number of additional booths in strategic areas throughout the campus. The student selects a program by dialing a 3-digit number from his booth. Many booths are equipped for audio-active listening. Individual tape recorders are available, designed so students can listen to prerecorded exercises and record their responses on individual tapes.

Oral Roberts University, Tulsa, Okla. Has 30 practice booths in language department, with individual tape recorders, microphones, and controls. A complete production facility is combined with random-access audio carrels and classrooms, with video distribution possible to some of the carrels and all of the classrooms. (Paul I. McClendon)

Principia College, Elsah, Ill. Foreign Language Laboratory with 32 positions permits listening, repeating, recording, and playback from teacher's console or student carrel; 6 programs may be used simultaneously (Douglas B. Swett)

Providence College, Providence, R.I. Has 30-position listen-respond-record laboratory for advanced students and 25-position laboratory for elementary courses, plus 3 classrooms that can be connected to tape facility. Uses mostly endless-loop cartridges. Dial-access TV and other expansions planned. (Laurent Gousie)

Purdue University, Lafayette, Ind. Has 3 language laboratory rooms, 1 with 60 student positions, and 2 with 30 each. The 60-station one is equipped with remote-controlled listen-respond-compare equipment for each student. The instructor-operated master console contains tape playback machines to provide all booths with preselected master lessons. Multiple programs may be simultaneously directed to individuals or groups. Can also project visuals. The 2 smaller laboratories are more conventionally equipped. (William Flint Smith)

St. Joseph College, Emmitsburg, Md. Complete listening laboratory and recording studio provide opportunity to practice simultaneous translation by means of a wireless send-receive system. (Sister Margaret Flinton)

St. Norbert College, West de Pere, Wis. Small-group buzz sessions in psychology are monitored by instructor who can listen and intervene if he wishes; all sessions also taped for instructor's later listening. (Neil J. Webb and Thomas F. Grib)

San Bernardino Valley College, San Bernardino, Calif. Laboratory being developed with recorders at each student station. When student dials, his computer-stored program is rerecorded at high speed (60 ips = 2 minutes for 30-minute tape) on his own recorder. Then memory bank is free for next demand. Video programs into carrels on telephoned request. (James M. Yurkunski and E. R. Rothhaar)

San Jose City College, San Jose, Calif. Random-access carrels provide programs in music, drama, languages, shorthand, political science, and a growing selection of other courses. (Robert I. Nelson)

State University of New York (SUNY) at Buffalo. Audio-passive laboratory with 20 channels, from central consoles, on request (library mode). (T. A. Razik)

SUNY, College at Geneseo. Recordings made in cooperation with college radio station; random-access listening laboratory has 40 stations, with 40 additional in planning stages. (Clarence O. Bergeson)

Stephen F. Austin State College, Nacogdoches, Tex. Has 36 booths, microphone headsets, and 5 simultaneous programs, audio-active used mostly in languages. (Carl Keul)

Stephens College, Columbia, Mo. Language laboratory of 60 listening positions is open 44 hours a week, sending out controlled programs, and also is used in the library mode. Replaces prior telephone system reported in 1963 *New Media*. (Albert J. Delmez)

University of California at Santa Barbara. Individual booths plus recorders at remote stations to receive the lesson, so that student can replay his own tape at his own time. (A. Dale Tomlinson)

University of California at Santa Cruz. Carrels connected to individual tape recorder room; similar to installation at University of California at Santa Barbara. (Marvin J. Rosen)

University of Colorado, Boulder. A major repository of magnetic audiotapes, available at cost of reproduction to educational institutions. (Louis H. Brown)

University of Florida, Gainesville. Listening laboratories in both laboratory high school and in University; audio-tutorial facilities are in planning stages. (K. A. Christiansen)

University of Illinois, Urbana. Students in Introductory French can call in from any telephone anywhere and audit a pattern drill lasting about 15 minutes; 2 programs presented on any given day can serve 600 students (15 lines). (Charles J. McIntyre)

University of Michigan, Ann Arbor. The Center for Research on Language and Language Behavior (CRLLB) organizes workers from 18 different disciplines to study 4 substantive language areas: processes, acquisition, modification, and structure. One of the studies concerns an individualized approach to modern language learning through the learning laboratory. (Eric M. Zale)

University of Missouri at Kansas City. Utilizes 2 SCA multiplex channels of the University radio station to broadcast repeats of lectures, language laboratory work, short courses, refresher courses, and seminars to students in listening centers, other colleges, and townspeople. May be heard only on receivers specifically tuned to the frequency of transmission, and only when the radio station is simultaneously broadcasting a general program. Institution is considering closed-circuit radio dissemination of tapes to classrooms to supplement laboratory. (Sam Scott and William Crain)

University of Nevada, Reno. Has 50 stations, 12 channels, remote selection via dial of continuous-loop audiotapes in a variety of disciplines. (Donald G. Potter)

University of North Carolina, Chapel Hill. Two-way radio conference program of the School of Medicine is designed to provide continuing education programs for physicians meeting as groups in their local hospitals. (Kenneth M. McIntyre)

University of South Florida, Tampa. All major lectures on the campus are taped and made available for later listening; other materials available include a complete set of shorthand tapes at varying speeds of dictation, required music and drama experiences, and articulation exercises for speech students. (G. C. Eichholz)

University of Washington, Seattle. The Language Laboratory carries 2 half-hour drill programs per week in each of 26 languages. The Laboratory handles 2,500 student registrations per quarter, and approximately 10,000 student contacts; open 13 hours daily plus some Saturday time. (George Buck)

Wellesley College, Wellesley, Mass. Experimenting with audio tutorial in biology. If it is decided to adopt, will install carrels with recorders, projectors, and laboratory supplies. (Virginia M. Fiske)

Westbrook Junior College, Portland, Maine. Electronic shorthand dictation provides 30 stations, 66 programs, at various speeds, for use in class and out of class, via a portable wireless system. (Thelma H. Adams)

Western Michigan University, Kalamazoo, Mich. Closed-circuit audio connects 11 playback machines to residence halls, classrooms, and a commuter center. Limited random-access installation. (Richard E. Clark and Lynwood H. Bartley)

Wichita State University, Wichita, Kans. Has 57 stations and 16 sound sources, one part as language classroom and other part listening laboratory (library mode). (Carol S. Holman)

SUMMARY

Widespread use of the listening laboratory and tapes and rapid development of their applications in additional disciplines indicate that they have passed the experimental stage and will continue as valued and important aspects of learning. Nevertheless, some problems remain to be worked out in making them fully effective in college teaching. One such problem is that of random access to the lesson desired. The system now in general use can respond as rapidly as a telephone to the first caller and can admit a second (or hundredth) caller to the tape in progress. More expensively, and with a slight delay, master tapes can be reproduced for each caller; but it is still not possible for each student to count on hearing the program that he desires at any time without any delay. It does seem certain, however, that this necessary technical advance will be achieved within a decade or less.

Another problem involved with listening laboratory and taped experiences which has been noted by observers of student carrels is the restlessness of the student. It appears to be difficult for a student to listen without activity for extended periods. This phenomenon has led some users of taped listening to feel that workbook activities or laboratory manuals, including visual materials and exercises to be completed during the course of the tape, are necessary adjuncts for learning. The problem, of course, does not arise in language or shorthand drills; it does become apparent during music, drama, or lecture programs. In order to increase the active involvement of students in learning, much work needs to be done in developing appropriate response programs for use during listening sessions. Only a few institutions are experimenting with such materials.

Perhaps the major factor, here as in other uses of new media, is the willingness of faculty members to prepare adequate materials. The story is told of a lecturer who found that when he planned and recorded a lecture in the privacy of the sound studio, he presented all of the material much more coherently in about two thirds of the class period; he eliminated unnecessary and distracting side remarks and digressions. Is it possible that the major advantage of new media is the fact that they enable the professor to see and hear himself, and to be seen and heard by his colleagues, with the consequent motivation for improved performance? At any rate, a taped lecture or learning exercise requires planning, research, tryout, and revision if it is to achieve its potential contribution to the education of the student. Thus methods must be found to encourage professors to invest the needed effort so that fully effective use may be made of listening laboratories.

Despite these apparent difficulties, however, the audio experiences of listening laboratories and tapes are seen to be useful adjuncts to classroom instruction: they can save time for both the instructor and the student; they can carry the burden of repetitive drill and provide ready access to a broad range of instruction in several disciplines. Their economy is another recommendation; after the first capital outlay, the cost of producing and reproducing tapes is nominal as compared with the cost of videotapes. Further, the widespread availability to students of portable tape recorders increases the likelihood that extended use will be made of instructional tapes. From observations in college and university audiovisual equipment rooms, the HEMS staff are convinced that there is a great deal of useful work with audiotape recorders being carried on around the country that has not been reported by the correspondents in this study, simply because such work does not seem to be innovative or unusual. But in any situation where simple sound is more important than a picture, the audiotape can be used with economy and flexibility to improve instruction.

VI

PROGRAMED INSTRUCTION

PROGRAMED instruction is a technique of self-instruction that usually involves presentation of instructional materials in small segments, followed by tasks that permit students to demonstrate their comprehension or skill. If they perform these tasks correctly, they are then presented with other sequences of learning-response-judgment; if they make errors, they must either restudy the same material or "branch" to additional instruction before being allowed to proceed with further instruction. The reinforcement effect of immediate knowledge of success or failure, in such cases, is believed to be a powerful stimulus to learning.

Programed learning may be presented in printed form, in simple or quite complicated teaching machines, by several uses of tapes, or by computers. All these modes are used in higher education. Yet, there are no reports indicating that programed learning is used as the sole model for instruction, without supplement by other methods of presentation or assessment.

The task of the professor nowhere has been abdicated entirely to the program. Instead, programs seem to be used to enable the student who needs introductory or remedial work to brush up by himself; more often, they are used as part of an array of teaching techniques, supplemented variously by lectures, tutors, random-access tapes, laboratory experiences — alone or in combination.

Some of the most successful self-instructional programs appear to be those that require the student at a given point to read in a textbook, view a single-concept film, perform an experiment, or listen to a tape. Except in elementary skill subjects, it is still rare to find a completely self-contained teaching program.

CASE DESCRIPTIONS

Programed Instructional Materials for Basic Courses in Electrical Engineering

Carnegie Institute of Technology, Pittsburgh, Pennsylvania
Everard M. Williams

Evolution in teaching methods and course objectives in basic electrical engineering courses at Carnegie Institute of Technology in recent years has led to some emphasis on task-oriented rather than strictly content-oriented learning. In this evolutionary development, classroom and laboratory teaching includes learning experiences in which the students practice on a sequence of new and somewhat realistic engineering problems of graded difficulty. The classroom instructor acts as a guide and umpire rather than as a source of instructions for solving the problems. In this instructional rationale, home study of conventional text materials is relied on to provide necessary analytical skills, physical concepts, and principles. Home study, however, has not proved entirely reliable, and some diversion of classroom time into remedial instruction was found necessary. Work was initiated on the preparation of programed texts, their use, and tests of the results.

Programed texts were used for some years for parts of the basic circuits and fields courses. In the fall of 1965, a complete set of programs became available and was used in test sections of the basic courses in electric circuits. The results were favorable, and massive use of the programed materials by all sections of the appropriate courses was started in the fall of 1966.

Student acceptance of the overall rationale and the programed texts, which are in book form, has been excellent on the whole. However, the "bottom" performers have done more poorly with the programed texts and current instructional strategies than would appear to have been the case for similar students under the older rationale. This result is attributed to the fact that present instructional strategy does not cover in class any of the learning experiences that are supposed to be acquired from the programed texts, and, therefore, students who lack the motivation for home study do not find a substitute in class experiences.

Considerable difficulty has been experienced in formulating meaningful tests of the effectiveness of the overall educational rationale, or even of the use of programed texts in themselves, on a continuing basis now that the novelty of the first experimental use is over. Also, it is difficult to obtain data on the extent to which the student follows the programed sequences carefully and in exactly the manner intended by the author. With the textbook form employed, there is no simple method of feeding back details of student use to the instructor. Some tests are projected with computer administration of the program materials in order to obtain closer frame-by-frame records of students' performance.

The various volumes in the series are in mixed linear and scrambled formats. No preference or difference in effectiveness has been found between the two modes, although it is quite clear that one or the other may be more convenient for particular repertoires in the subjects taught.

The preparation of programed works on elementary electric and magnetic fields is nearly over, and complete tests of such materials are planned for the fall semester of 1967.

Quantities of the programed materials have been made available to educational institutions without charge when it has been clear that their experimental use will be accompanied by some attempt to test and evaluate program effectiveness.

The Reading Center at Flint Community Junior College
Flint, Michigan
Clarence A. Anderson

The Reading Center recently developed at Flint Community Junior College is basically an educational skills center with a reading emphasis. Many college students during the course of their maturing years encounter problems in reading that they are unable to resolve by themselves. The College has thus established a Reading Center to provide a wide variety of services to promote reading effectiveness.

Reading tests, both survey and diagnostic, are administered to enable the student to determine his present level of reading achievement and to ascertain the particular types of difficulties he is experiencing. Other related services in the area of personality also are available in cooperation with the professional staff of student personnel services.

The reading program is based on two basic assumptions: first, that students have common reading problems as well as unique problems that must be dealt with individually; second, that in dealing with individual students, self-controlled pacing and individual programing are superior to group-paced techniques.

The testing program has confirmed the wide range of reading ability — 10 levels — from grade 6 through grade 15 plus. Every student, on completion of testing and other intake, is placed into an individualized reading program — programed or semiprogramed — at his own reading level. This program could involve (a) orientation to reading; (b) vocabulary, both contextual clues and structural analysis; (c) comprehension, both literal and critical; (d) rate; (e) subject matter reading; and (f) how to study.

In addition to the array of materials described above, many mechanical devices are available for individual use. Although mechanical aids are generally considered to be helpful but not essential in a reading program, our experience has been that they have tremendous motivational value.

Thus far our limited program has been highly successful, both from the standpoint of the number of issued certificates for outstanding progress as well as the positive reaction which was shown by participating students.

The key to the Reading Center's success is individualization of instruction and development of a self-teaching, self-pacing curriculum. Each student starts on a level where he can experience success and progress at his own speed; he is fully aware of his rate of progress at all times. Materials and equipment are available at individual booths and carrels to facilitate individualization of instruction.

Plans are now under way to expand the program to handle 400 to 800 students per week — 1 hour three times weekly. Long-range planning also calls for doubling this facility and student load.

Programed Materials Learning Laboratory
Forest Park Community College, Forest Park, Missouri
Charles Gilbert

The Forest Park Community College has established a Programed Materials Learning Laboratory to offer students the opportunity to improve basic skills by means of regular, individualized periods of study in which a variety of programed learning materials is used.

The Learning Laboratory is supervised by specially trained coordinators with teaching backgrounds who oversee the use of materials, record test data, assign materials to be studied, and confer with students periodically.

Programed subjects include English and language arts, arithmetic, mathematics, social studies, science (chemistry, biology, and certain basic materials in the physical sciences), business, and foreign languages (French, Spanish, and German).

Approximately half of these materials provide instruction typically given to pupils prior to the ninth grade; 40 percent teach high school subjects and skills; the remaining 10 percent teach a technical or adult subject.

Since the laboratory is planned primarily for the underachieving student and for the low-ability student, it is operated on several distinct learning principles. First, instruction is individualized. Each student is tested and then works on material he can master. He proceeds at his own rate, bypassing areas of study with which he is already familiar. Periodic examinations are spaced for maximum reinforcement. He must pass at an acceptable level or go back and restudy the material.

Again, because the student defines his own objectives at the time he enters the Laboratory, the burden of responsibility for assimilating the material is placed on him. If he takes an active day-to-day part in the learning process, he can see immediate progress toward a defined goal.

Completion of prescribed levels of achievement in basic skills qualifies the student to enter certain of the regular college transfer, developmental, or career programs.

Admission to the program of the Learning Laboratory is based on score attained on the standard placement test (SCAT) given entering students by the College. A score at the tenth percentile or lower automatically assigns a full-time student to the general curriculum. This includes participation in the Learning Laboratory.

In addition, students who were dismissed from the College the previous semester for academic reasons are eligible to enroll full-time or part-time in the general curriculum program. They therefore automatically work in the Learning Laboratory.

The initial placement in the laboratory program is in reading, language arts, and mathematics. Placement is determined on the basis of tests given by the coordinator.

The physical facilities of the Laboratory are temporary at present pending completion of the College's permanent campus. The Laboratory's programed materials are stored and displayed on seven 5-foot movable shelf-carts. When in use the shelves are rolled into a special enclosed section of the school cafeteria and are arranged down the center aisle. The cafeteria tables and low stools provide work space on each side. The present catalog of programed materials, most of which are of the notebook type, requires approximately 200 feet of shelf space for storage and display.

The coordinator's desk is located near the entrance, along with equipment to file each student's records and to allow students to sign in and record their own progress data. Student conferences with one of the three coordinators are held at or near the coordinator's desk, or at a vacant cafeteria table nearby.

The cost outlay for the Laboratory was approximately $5,000 in materials, texts, and equipment.

Programed Instruction at Fort Lewis College
Durango, Colorado
Harry C. Rosenberg and Kenneth I. Periman

The basic materials used in M101, Fundamentals of Mathematics, are programed materials with content ranging from elementary concepts in sets to the basic concepts in what was once called intermediate algebra. However, because of (a) the nature of programed materials, and (b) the various purposes which the course must serve, the course is supplemented with both weekly lectures and problem solving that is not an integral part of the programed materials.

The weekly lecture is intended to broaden the student's perspective of mathematics and so to make the course more effective as a terminal course for nonscience majors as well as a beginning course for the science major.

Supplementary problem material corrects a basic deficiency in programed material of this type; namely, the scarcity of problems for drill. Though the programed material handles the concepts quite well, it gives the student little opportunity to use what he has discovered; hence, students are unable to function effectively in problem solving even though they seem to grasp the basic ideas involved.

The basic format of the course, then, is (a) a daily lab in which tutorial help is available, (b) a weekly lecture designed to broaden the student's perspective of mathematics, and (c) assigned problems in addition to the problems in the program. A student is permitted a maximum of four trimesters to complete the course. This gives the student whose background is extremely poor a chance to absorb the necessary material.

English 3200 has been used for all first-semester freshman English classes for 2 years. Although this text uses the terminology of traditional grammar, with which incoming freshmen are familiar, its emphasis on sentence patterns and related types of grammatical structure shows the influence of linguistic grammar. Many instructors have been pleased with sections which correlate sentence structure with punctuation and which stress practice with variation of pattern to develop sentence style.

All students who score below the eightieth percentile on the American College Test are enrolled in first-semester freshman English classes. Those scoring above this percentile are eligible for an advanced placement program which does not include *English 3200*. During class time designated for work with *English 3200* an upper-class student employed by the College administers and checks unit tests. This procedure enables the instructor to offer individual help in the classroom and to review graded tests with students.

In addition to its use in freshman English, *English 3200* has proved a useful review tool for many seniors who are preparing to teach. Members of the English faculty administer tests to these students as they complete units.

Fort Lewis instructors have felt that *English 3200* offers these advantages:

- Responsibility for mastering this basic material, which many incoming freshmen do not know, rests more directly on the student than it did with the classroom instruction involving workbook or handbook exercises.
- Programed material allows the competent student to complete his review quickly. He is then excused from this portion of the class work.
- It gives the instructor the opportunity to work individually with the poor student who needs extra help.
- It helps many poor students to understand English grammar.

The approach used at Fort Lewis College is not revolutionary. Instructors take 1 hour per week from the regular class time or add on 1 or more hours above the usual 3 in order to do the *English 3200* work. Students work individually and are given a maximum of freedom in learning the material. The instructor's individual oral review of tests with students to check the adequacy of learning, as well as various oral explanations to the students in answering their questions before testing, is made possible by the presence of the student grader.

Until it is possible to put enough high school teachers into the field who are well trained in a modified approach to language, *English 3200* will continue to hold its own. Students who have mastered the course are able to think intelligently about their language usage problems.

Programed Instruction in an Art Gallery

State University of New York, College at Fredonia

Robert M. Diamond

This project tested the effectiveness of programing college humanities students through an instructional learning sequence in an art gallery. While preliminary experimentation was conducted at the University of Miami, several additional programs have been developed for use in the world history course at the College at Fredonia, using fine quality prints in a mobile exhibit.

In the original experiment a 56-page branching programed booklet was developed in the area of Renaissance art. On entering the exhibit, students were handed the programed book which referred them, during the sequence, to specific paintings. A letter coding was used with the labels on the paintings covered to prevent the students from using this information to help select the correct answer. This was particularly important since a major objective of the program was to develop an ability to differentiate, by certain characteristics, early and late Renaissance paintings.

The students in the experimental group were given a 19-item pre- and post-test composed of identical questions but using different though comparable paintings. An extensive opinionnaire also was administered to determine student attitudes.

Thirty-one first-semester freshmen were included in the experimental group. An additional 222 students went through the program and completed the attitude questionnaire.

Test results will be found in Tables 1 and 2.

TABLE 1

Test Results (19 items)

Test	*Mean*	*SD*
Pretest	11.1	2.825
Posttest	17.5*	1.478

* A correlated *t* was performed, with a resulting *t* of 13.77, significant at the .001 level.

TABLE 2

Test Results, Frequency Distribution

Number correct	*Pretest*	*Posttest*
5	x	
6		
7	xxx	
8	xx	
9	xxxxx	
10	xxx	
11	x	
12	xxx	
13	xxxxx	
14	xxxx	x
15	xxxx	xxx
16		xxxx
17		xxxxx
18		xxxxxxx
19 (100%)		xxxxxxxxxxx

Student reaction was highly favorable and, in a majority of cases, enthusiastic: 70 percent (of 253) found the experience to be extremely interesting, 96 percent felt that this was an effective instructional technique, and 94 percent stated that they would like more programs of this type.

Conclusions to be drawn from this study are as *follows:*

1. Students can learn about paintings using a programed sequence in an art gallery or with an art exhibit.
2. Most students have a very favorable attitude toward a programed viewing experience of this type, and a great number of them would like to have additional lessons taught in this manner.
3. This is an effective technique for bringing students to an art gallery for the first time.
4. Specific instructional objectives can be accomplished in this manner without an instructor present.
5. The technique provides an efficient way to utilize an available art resource within an instructional program particularly when large numbers of students are involved.
6. The development of a programed unit of this type requires both the time and talent of several individuals. (Approximately 80 man hours were spent developing and testing the 25-minute program.)

Programed Instruction as Part of a Televised Course in College Economics

University of Illinois, Urbana
Charles J. McIntyre

A televised course in college economics has been offered for the last 6 years at the University of Illinois and frequently revised by the instructor. An experiment was designed to compare three lessons from the course with the same content developed according to certain principles of programed instruction. These principles included careful specification of lesson objectives; independent test items to measure these objectives; careful sequencing of the material; pretesting the developed lesson plan with individual students and making modifications as indicated from this procedure; providing *for student response and* knowledge of results in the televised instruction.

Students were divided randomly into two sections with each section getting the same instruction except during the experimental phase. In this phase one section saw the control version, and another section saw the experimental version.

On the immediate posttest and on a delayed posttest embedded in the final examination, students in the experimental section exceeded those in the control section. The difference was significant at the .05 level.

The experimental version was revised again. Special attention was given to improving the presentation of those materials in which the examination showed little or no difference between the experimental and control sections. On an immediate posttest the students in the experimental version exceeded those in the control section with a difference significant at the .01 level. A delayed posttest also yielded significant differences.

A course evaluation questionnaire was administered which demonstrated that the revised course was evaluated more favorably than the course in its original version. This course evaluation instrument was developed through multiple versions of factor analyses after administration to thousands of students in hundreds of sections.

Subsequently, the remainder of the course has been revised according to the principles and procedures followed in the experimental lessons.

INSTITUTIONAL INVENTORY

Alaska Methodist University, Anchorage. *English 3200* required of some students in addition to regular composition course. No credit. (O. W. Frost)

Augustana College, Sioux Falls, S. Dak. Chemistry-physics integrated (currently developing) by program that will branch to laboratory exercises, film loops, computer exercises, other written materials. (J. D. Thompson)

Bennett College, Greensboro, N.C. Programed Learning Laboratory has 22 student stations used in language with phonetics program and tapes, trigonometry, English, physics. (Norman Licht)

Carnegie Institute of Technology, Pittsburgh, Pa. Printed book programs in electrical engineering substitute for some class time. Difficult for instructor to get clear report on students' use of programs. (Everard M. Williams)

Colorado State University, Fort Collins. Has 10 programs in agri-chemical application being tested for use with pesticide distributors. (C. O. Neidt)

Flint Community Junior College, Flint, Mich. Programed or semiprogramed remedial reading, supported by filmstrips. (Clarence A. Anderson)

Forest Park Community College, Junior College District of St. Louis — St. Louis County, St. Louis, Mo. Linear and scrambled programed texts available in library and used as part of classwork; some commercial, some made on campus. (Charles Gilbert)

Fort Lewis College, Durango, Colo. Fundamentals of Mathematics programed from elementary to intermediate algebra, supplemented by weekly lectures and additional problem solving. A student has daily lab with tutor, weekly lecture, plus problems. May take 4 trimesters to complete. Also, English freshman courses use *English 3200* with tutor available. (Harry C. Rosenberg and Kenneth I. Periman)

King's College, Wilkes-Barre, Pa. Using programed instruction successfully in chemistry courses for average or below-average students. (Jay A. Young)

Mesa College, Grand Junction, Colo. Business Math and Office Machines combined so that students learn both at once. In accounting and other business subjects, restructured materials obtain high correlation between text, supplementary materials, and transparencies. In engineering drafting, 2 weekly lecture sessions are combined with open laboratory plus laboratory instructor. Laboratories open at all times. (Davis C. Holder and R. E. West)

Montgomery Junior College, Rockville, Md. On new campus, lecture sections use CCTV and team teaching. Teaching machines are available for individual study. (George A. Hodson, Jr.)

National Education Association photo

Mt. St. Scholastica College, Atchison, Kans. Programs in foreign languages (supplementary instruction), mathematics (remedial), and to enrich offering in mathematics for individual students. (Sister Helen Sullivan, O.S.B.)

Palomar College, San Marcos, Calif. In addition to class meetings and text readings, programed questions are recorded on tape; the student listens and answers in workbook. A second "fast review tape" asks the question only once. (Harry C. Mahan)

Purdue University, Lafayette, Ind. Knowledge in chemical engineering taught by program; class time devoted to analysis, synthesis, and evaluation of open-ended problems. (Charles E. Wales)

St. Francis College, Brooklyn, N.Y. Calculus and other mathematics programs as supplement to class instruction require about 3-6 hours a week, plus tutoring and tests, in order to achieve results. (Brother Leo Quinn, O.S.F.)

San Jose State College, San Jose, Calif. Programed instruction in engineering and in nursing supported by AV Center. (Richard B. Lewis)

State University of New York (SUNY), College at Fredonia. Programed instruction in art gallery viewing in connection with course in world history; 25-minute program (for student) required 80 man hours to write and pretest. (Robert M. Diamond)

SUNY, College at Geneseo. Programed instruction is being developed as part of a new CCTV economics course. (Clarence O. Bergeson)

University of California at Santa Cruz. Self-instruction in nonacademic skill subjects to produce fairly complex behaviors in support of the academic curriculum. (Marvin J. Rosen)

University of Illinois, Urbana. A televised course in economics revised experimentally to include provision for student response and knowledge of results. Programing proved superior to excellent televised instruction without these organizing principles. (Charles J. McIntyre)

University of North Carolina, Chapel Hill. Using programed instruction in the teaching of health sciences. (Kenneth W. McIntyre)

University of Washington, Seattle. Printed programs, and synchronized slides and tapes used in dental courses (2 separate uses) in the School of Dentistry. (Boyd Baldwin)

University of Wisconsin, Madison. A programed notebook in nutrition course is being tested for use in facilitating notetaking and emphasizing salient points in College of Agriculture. (Maxine E. McDivitt)

SUMMARY

In the judgment of the HEMS staff, and indeed of many of the professional educators interviewed, the crucial problem of programed instruction is that of constructing the programs themselves. The construction of a useful program for college instruction requires not only deep scholarship on the part of the author, but a willingness to analyze the desired behavioral outcomes of instruction in the subject, state them in hundreds of quite small increments of learning, foresee the various misconceptions that students might form at each step, provide reteaching (branching) at each of these points, and commit the entire program to the appropriate format (printed book, teaching machine, computer). Thereafter, the program must be tested extensively and modified until it is capable of achieving its goals.

Since each instructor's course differs in some details from every other's, it follows that in many cases each instructor will prefer to use his own program — or at least one that has been developed on his own campus by his colleagues in the same department. At the present state of the art, at any rate, only one commercially developed program, in English, was reported to be used in any way in more than a single institution. Most programs are homemade.

In summary, it is evident that programed learning is a supplement, not a substitute, for the teacher in person-to-person relationships with students. The role of programed instruction seems to be primarily that of providing students with specific learning tasks that can be mastered economically and efficiently while working alone. There is no longer question as to the effectiveness of the various kinds of programs in teaching factual or repetitive material. The problem of the near future seems similar to the problem that arose after the invention of printing and the introduction of the textbook: to ensure an adequate supply of programs in each of the disciplines so that instructors can choose those that are competently devised and that fit well the objectives and outline of their course materials. Because most instructors will not be expected to be competent in developing programs for their courses, concerted effort will be required in order to provide the needed software to capitalize on the advantages of this learning technique.

VII

MEDIATED SELF-INSTRUCTION

THE self-instructional laboratory provides the space and the materials necessary for each student to learn at his own rate the concepts and information or skills for a given course. A distinguishing element of the "self-instructional" category is that the student ordinarily (but not always) attends self-study sessions of his own volition, not by assignment.

The category of self-instruction inevitably overlaps several of the other categories of new media discussed in this report. Yet there is a kind of use that has distinct characteristics worthy of separate mention, apart from listening laboratories, random-access carrels, programs, and computer terminals. Several excellent applications of the self-instructional laboratory were described in *New Media in Higher Education*.* Since that time there have been other applications of the basic idea, but to the HEMS staff it seems that here has been little additional innovation in this aspect of college teaching.

It is perhaps to be expected that the most frequent application of self-instruction should be in utilization of audiovisual equipment and techniques, as part of the preparation of teachers for the public schools. It appears that many campuses that prepare teachers now provide such laboratory practice in audiovisual techniques through use of a series of carrels that present a combination of sound, visuals, and the necessary physical equipment. In several, additional carrels give practice in the preparation of overhead projected transparencies, charts, and bulletin boards.

A second common application of the self-instructional laboratory is the one that enables students to make up attendance at missed lectures, or to supplement class materials by listening or working through a printed instructional program in much the same manner as students have always studied by reading in the library. The instructor makes arrangements for procurement of tapes of his own lectures, tapes of other valuable discussions taken from live radio or television, commercial films, printed programs, or slides. The college provides the equipment needed for presentation to the students. This learning situation is ideal, in that the institution provides the opportunity, but the student must supply the motivation.

The Postlethwait* model of self-instruction also is being extended to a wider scope of subjects than the original botany course at Purdue. Several new junior colleges especially are now attempting to achieve more personal contact between student and instructor by committing much of the factual content to a special type of programed learning. Under such arrangements, all students meet with the instructor weekly in general assembly sessions, and with discussion leaders more frequently in small assembly sessions. Most of the work of the student, however, is done at his own time in a study space, not necessarily enclosed, with a tutor present in the room to provide needed assistance. A pattern of tapes, live specimens, charts, diagrams, and other items is prearranged to enable each student to proceed at his own pace in completing laboratory assignments. Automated independent study actually enhances the opportunity of the student for small-group interaction with his instructor. Some of the small-group sessions may be conducted by tutors or discussion leaders, leaving the principal instructor free to visit the small sessions and to work in refining and improving his presentations.

The advantages already realized from this combination of self-instruction and group instruction have led to adoption of the pattern in single classes at several universities, and the development of two newly established junior college systems that emphasize self-instruction as the primary approach to learning. Under this plan, the teacher (a) is freed from a crowded schedule of repeated sections of a course; (b) is available for small-group and personal interaction with his students; and (c) has time for more intensive planning of the materials to be presented both in the assembly sessions and in personal conferences with the student.

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* *Op. cit.* See especially pp. 119-30.

* See "A Multifaceted Approach to Teaching Botany, Purdue University," by S. N. Postlethwait, in *New Media in Higher Education*, pp. 126-30.

CASE DESCRIPTIONS

Learning Center at Oklahoma Christian College

Oklahoma City

R. Stafford North

The Oklahoma Christian College Learning Center, which opened in the fall of 1965, provides each student with his own individually assigned learning carrel, which has a desk top, an "L unit" for typing, a bookshelf, and a locking cabinet. Currently there are 862 carrels, with space in the building for 1,016. Three additional dial positions are located in an auditorium which is divisible by motorized walls into classrooms.

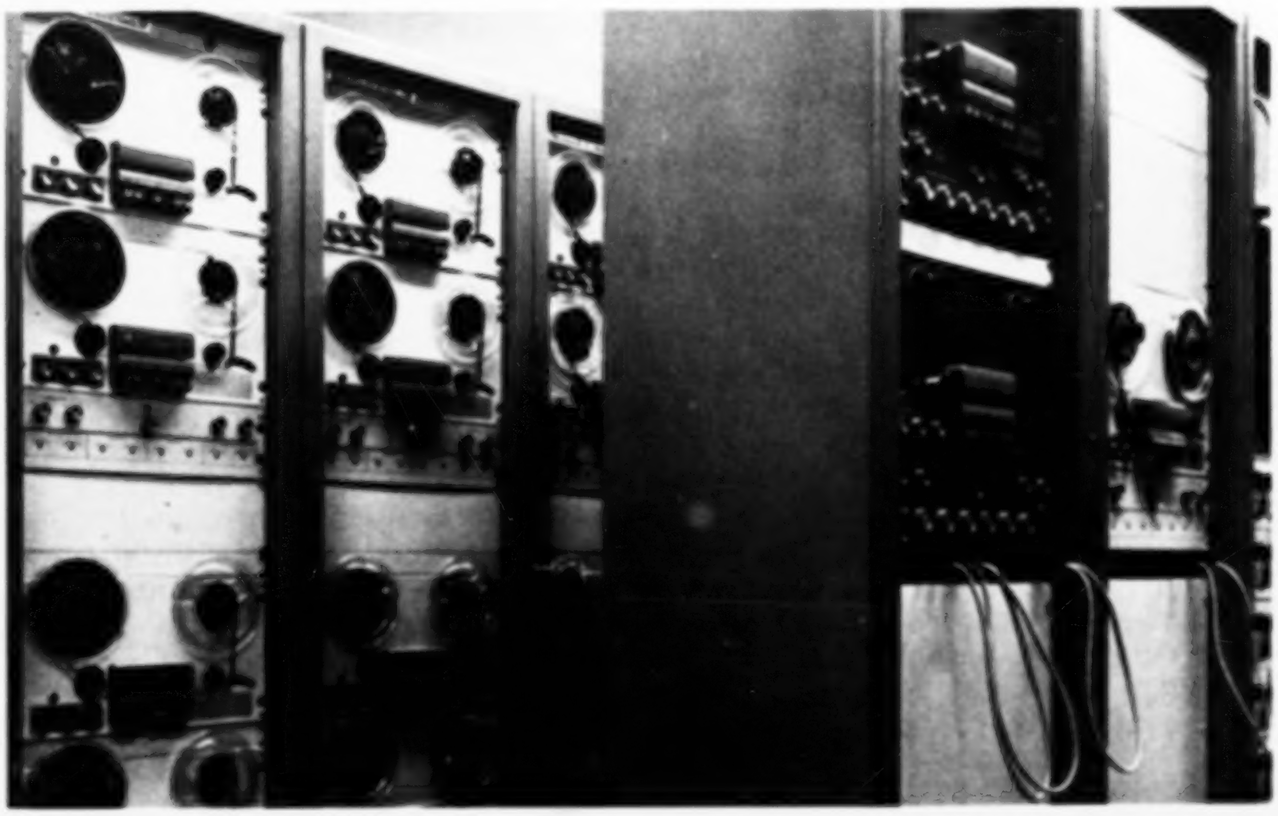
In the carrel, available from 7 a.m. to 11 p.m. daily, a student may read or study in a quiet atmosphere, or write a paper with the school's library collection available in the same building. Each carrel is equipped with a dial and a Telex-1200 headset, providing the student immediate access to any of 136 audio recordings. Most of these recordings are an integral part of the experiences planned by the teacher of a course, and most of the tapes are accompanied by a workbook which provides visuals, a semiprogramed response pattern, and structured note space for the student to use while he listens. In reorganizing a course to employ audio-recorded lectures, exercises, or resources, the teacher frequently alters the class meeting arrangements, most courses meeting fewer times a week but providing more student participation in the sessions than before.

In the Learning Center, the recordings expected to be in heavy demand are controlled by time clocks on a scheduled basis on 36 channels reserved for this purpose. The other 100 channels are used for dial-start programs expected to be in less demand. A weekly directory informs the students of times and numbers to dial. Forty-six Magnecord tape transports, 22 of which are four-track in one direction and 24 of which are two-track, provide the automatic replay system. The crossbar switching network employs a custom-designed computer developed by North Electric Company.

In addition to the opportunity for reading and listening, the student may also check out Ampex E-65 recorders for converting his carrel into a language laboratory. Single-concept projectors and slide and filmstrip projectors also are available.

The control room in the Learning Center also contains an audio production center. Two recording studios are equipped so the teacher can both record and monitor as well as communicate with the recording engineer. The recording and duplicating facilities utilize five recorders and one playback unit. Half-track and quarter-track recording is possible, and one machine can record four tracks simultaneously in one direction. A telephone line, AM-FM radio, and disk playback also are located on the console.

In sum, then, a student uses his carrel as the hub of his academic day. It is a place to store his own materials, to study between classes, to hear audio materials, to do research or typing, and to view projected



DATAGRAM dial-access learning system, heart of Oklahoma Christian College's new Learning Center in Oklahoma City, provides 136 taped instructional programs which can be dialed by each of the College's 720 students. Shown are the tape decks and program amplifier cabinets, integral units of the North Electric Company system.

materials. Not only does he have a wider range of study facilities than usually available, but these are housed in an area with an environment controlled for a study atmosphere.

A study of the first three semesters of use of this Center was expected to be completed in August 1967. Sponsored by the USOE, the study sought to determine the impact of the Center on attitudes and activity patterns of both faculty and students.

New Media Use at Oklahoma State University

Stillwater

J. C. Fitzgerald

At Oklahoma State University two courses in botany are being taught by the audio-tutorial method rather than the conventional lecture and laboratory sessions. The course method is described as being composed of three parts: a general assembly session, an independent study session, and an oral quiz-discussion session.

1. *General assembly session.* Two 1-hour sessions per week are conducted by the major professors of the course, during which the tenor and intellectual tone of the course are set by lectures presented by a major professor of the course or by visiting lecturers from this or other institutions. At these sessions there are also presented various general directions, announcements, movies, and five major examinations.

2. *Independent study session.* The learning center, the heart of this method of instruction, houses the equipment and facilities for the independent study session — 46 booths or carrels, tables of demonstration materials, and supplies and equipment for conducting experiments. Books and other illustrative material, projectors with short films that can be operated by the students, and many different plants and plant products are available, suitable to the particular phase of the course being studied. Each carrel contains a tape recorder with taped instructions and brief lecture materials. The tape gives instructions for the completion of workbook assignments and directions for the completion of laboratory work to be done and material to be observed in another part of the center. Short lectures concerning the weekly work of the course and information concerning any experiments to be conducted are presented by means of tape. Each carrel contains microscopes, slides, and other material. It also is equipped with an 8mm projector and single-concept loop films for description of some phases of the course, such as mitosis, etc., which can be best presented in this way. The learning center is available to students from 7:30 a.m. until 10:30 p.m. 5 days a week and Saturday morning. Each student spends an average of 3 hours per week in the individual study center, but he may spend as many hours as he wishes or needs to learn thoroughly the week's assignment. This freedom is quite popular with both students and faculty. A professor or graduate assistant is in the learning center at all times. The center also contains an environmental growth chamber.

Specially equipped carrels distributed throughout the Oral Roberts University Learning Resources Center contain dial equipment for remote access to videotaped and audio programs.

3. *Oral quiz-discussion session.* One hour every 2 weeks or more often if time permits, in groups of 8 to 15, students will meet with a major professor for a session that consists of an oral examination and a discussion covering the previous work in the course. Professors believe these quiz sessions will result in several improvements in their teaching and in student learning. (a) The major professor is freed for more personal contact with students and becomes involved more directly with them in all phases of the course. (b) It seems likely that an increase of up to 50 percent in course content may be experienced. (c) Students in the learning center can proceed at their own pace. Any student can rerun the tape and go over the materials until he has acquired mastery.

This same audio-tutorial system is being used on a smaller scale for physics and zoology as an experiment. Plans are already under way to produce some 8mm single-concept films on the campus.

The Self-Learning Center of the School of Forestry

Oregon State University, Corvallis

Robert R. Reichart

The ultimate aim of the Self-Learning Center of the School of Forestry at Oregon State University is to improve forestry education. More immediately the Center wants to find out the extent to which independent study may be effectively utilized through the use of new communication devices.

Modern communication equipment—tape recorder, moving pictures, filmstrips and slides, tape recorders which automatically change slides at the proper times, representational devices of any kind — all are ideally suited to independent study. All can be used by an individual student at a time convenient to him. The pattern seems very simple: get the teaching materials in some recorded or visual form, provide a place for students to use these materials individually or in small groups, and then determine their effectiveness.

The School of Forestry was an excellent place to try out this idea. Modest physical facilities were available: a 20′ x 30′ basement room in the Forestry Building, a convenient location for Forestry's modest segment of the campus population. The room was equipped with a dozen study carrels, a desk for a receptionist, a worktable, and cabinets for storing equipment. Half a dozen recorders and slide projectors (in addition to other audiovisual equipment) provided the basic tools for the project.

When the project started in 1963, the Center tried to purchase forestry teaching materials, but outside of printed matter and a few 16mm movies, nothing was available. The Center, thus forced to create its own new media applications, has concentrated on producing a wide variety of tapes — explanations, examples, lectures, and problem solutions, illustrating these whenever possible with 35mm colored slides. Other media were used when they lent themselves to independent study, but the main effort has been on making high-quality tapes.

At first progress was slow. A number of teachers were willing to try a new approach, but some were hesitant about having their lectures taped. Others felt that tapes would eliminate some vital though indefinable quality from their explanations. However, materials gradually came into existence, and the advantages of the project became apparent. Here are some instances which show how it progressed:

- A graduate student, employed in a city 50 miles away, was unable to attend weekday lectures but could do laboratory work on Saturday. The Self-Learning Center taped the weekday lectures, making it possible for this student to finish his program.
- Teachers who had to miss classes were able to tape their lectures in advance and let students proceed without interrupting their work.
- Taping a substitute's class talk enabled an instructor to know what material was covered in his absence.
- Many talks by visiting experts were taped by the Center to make them available to students who had conflicting schedules. Such tapes could also be used by students in future classes.
- Instructors found that by taping explanations of ideas, as well as lectures, they would not need to repeat the same information time after time.
- Some instructors taped exercise instructions for students and then deposited these tapes in the Center.
- One teacher showed sets of slides in his classes and overcame time limitations by sending the slides to the Center at the end of the class hour, where students could study the slides with no time limitations.
- In a graduate seminar all presentations and discussions were taped, and the professor later met individual students in the privacy of his office to criticize and discuss their performances. When such class talks had enough general value, they were retained permanently in the Self-Learning Center.
- Actual job experience during the summer is a requirement in the School of Forestry. Before leaving school last spring students in one group were asked to take pictures and make notes during their summer work. Now, back in college in a senior seminar, they have the raw materials for making tape-slide presentations showing what they did and learned during the summer. This project may result in valuable and unusual items for the Self-Learning Center.
- In a few instances instructors have made a series of tapes covering all the lectures in an entire course, thus providing for either preview or review.

At present the Center has accumulated over 200 tapes in a variety of subject areas, many of them illustrated with slides.

No attempt has been made as yet to assess the experiment quantitatively, but some valuable ideas have been suggested by experience so far:

- Students will use such a facility if the materials offered actually aid learning. Teaching materials for use in the Center *must be better* than those used in class. Materials which are successful in the Center, however, also are effective in class.
- Faculty use of the Center has grown steadily and is accelerating. This may be the result of putting all audiovisual work in the school under the direction of the Center, thus saving valuable faculty time in the physical handling of equipment and enabling personnel of the Center to contribute ideas and production skills. In turn, this has influenced the faculty to recommend to students a greater use of the Center for independent study.
- Faculty standards of teaching have been raised since the Center started. Teaching materials provide an objective means of evaluating effectiveness. The professor, on listening to a tape of his own explanation of a concept, is seldom satisfied, and *of his own volition* revises and improves his work.

The improvement of teaching that results from such faculty self-criticism was not envisioned in the original plan for an independent study experiment. Yet, it may be its most important outcome.

The Integrated Concepts Approach to Teaching Geology

Principia College, Elsah, Illinois

Forbes Robertson

The integrated concepts approach developed by Postlethwait at Purdue University for botany employs what is rapidly becoming known as the audio-tutorial laboratory. At Principia, it is an audiovisual geological materials laboratory in which the student integrates ideas obtained from a text, manual, or workbook with teaching aids to solve simple geological problems. The method was introduced into the geology curriculum at Principia College in fall 1965.

The main objective is to provide a much better simulated field experience for geology students. Substantially more geological materials can be presented to the student on a more nearly direct teacher-to-student confrontation by means of the tape, increasing the depth of understanding and avoiding reliance on rote memory. Greater integration of concepts can be accomplished by this method. In addition, the responsibility for learning is placed much more directly on the student. An early hope that the method would reduce the instructional load proved to be a misconception.

The laboratory is open from 8 a.m. to 10 p.m. and is staffed with an instructor or student assistant most of those hours. Fourteen booths are equipped with tape players and each pair of booths with a 300-watt slide projector, simple polarizing microscope, pocket stereoscope, etc. Some stations are double stations with two sets of headphones from a tape player, enabling students to work together. Materials to be investigated are available to the student on the display table. The student obtains information, collects the materials needed and takes them to his booth, examines them while listening to the tape, and then returns them for the next student. Only a small amount of material is needed if examination time is limited to 5 to 10 minutes. Care is taken to avoid long discourses on the tape. Students are directed to get involved in working with geological materials after no more than 10 minutes of explanation. After the work is done, the tape may explain what the student should have observed, thus providing a reinforcing experience for those who did the work correctly and a correcting experience to those who made inaccurate or incomplete observations.

Photo by Therold S. Lindquist

Numerous remedial English sequences (organized units of self-instructional materials) are now available in the Independent Study Laboratory at the State University of New York, College at Fredonia.

One period each week is used for a general lecture or for examinations. Three local field trips of 2-hour duration and one 2-day field trip to the Missouri pre-Cambrian region are integral parts of the course.

In weekly honors projects, research experiences are planned in which the student devotes 1 week to the investigation of some aspect of a geological problem which has not heretofore been exhausted.

The weekly oral quiz is the heart of the method. Each week, except those in which a 1-hour exam is held, students meet in groups of no more than five for 20 minutes with one of the professors. The students must participate in the questions and discussion for a satisfactory grade.

Two 1-hour written examinations and a 2-hour final are about equal in weight to the oral quizzes.

Many topics have been presented so differently from the conventional method that correlations are difficult to quantify. These clear convictions seem justified:

- The method does place the responsibility of learning on the student. The great majority of the students rise to meet the demand of greater self-disciplined learning.
- The amount of geological materials that may be introduced to the student is very great, two to three times the conventional approach. The demands are for new and more highly integrated materials. It does not take a great deal of material, but many well selected items.
- Additional topics may be introduced within the allotted time available for the course.
- Grades for the first year were substantially the same distribution as in previous years, but the course level was substantially elevated.
- There is a very direct relationship between effort expended in the audio-tutorial lab and the final grade, as shown in the following table:

Letter Grade	*Average time per week PHYSICAL*	*Average time per week HISTORICAL*
A	3.4	5.3
B+	4.3	4.6
B	4.0	3.9
C+	3.7	3.9
C	3.6	3.6
D	2.9	3.4
F	2.7	2.0

- There are needs for single-concept and integrated-concept films that students can operate at any time.
- Principia College has just scratched the surface of the potentials of the method. It is a better teaching method, whether descriptive materials are involved for 3 or 300.

An Audio-Tutorial Approach to Teaching Botany
Purdue University, Lafayette, Indiana
S. N. Postlethwait

The audio-tutorial system at Purdue University began as an attempt to make some adjustment for the diversity of backgrounds of students in a freshman botany course. The 4-hour credit course involved 380 students and served mainly freshman students in the Schools of Pharmacy and Agriculture. These students had attended a great variety of high schools so that some had received excellent training and others relatively poor training. Students with equal capacities could not perform equally well because of these background differences. To assist the students with poor background, it was decided to make a special lecture on tape each week and file this tape in the Audiovisual Library, where students could hear the supplementary lectures and thus be enabled to compete more effectively. In the course of preparing these lectures, it became apparent that the student might well bring his textbook along so as to relate the subject matter in the text to the subject matter covered by the tape lecture. Later it seemed logical to add the use of the laboratory manual, so that the subject matter in the laboratory manual could be related to the subject matter in the text and to the subject matter on tape. Still later it seemed feasible to provide the student with plants and experimental materials so that these, too, could be related to the laboratory manual, textbook, and tape lecture. Ultimately the discussion on the tape was no longer a lecture, but rather a discussion on a teacher-to-student basis, in which the instructor was tutoring the student through a sequence of learning events. While arranging various items of laboratory equipment and plant material on a table, the instructor talked into the tape player as though he were helping a friend study. Learning experiences included reading from the text; doing an experiment; collecting and analyzing data; manipulating a microscope; watching a time-lapse movie; observing plant specimens, charts, diagrams, and photographs; and listening to brief lectures or discussions.

The success of the initial tapes led to an experiment involving 36 students for one semester which further confirmed the potential of the audio-tutorial system. At the end of the second semester of experimentation, the instructor met with these students to restructure the botany course, disregarding all traditional limitations and placing total emphasis on student learning. The group tried to eliminate all busy work and to adapt the method of presentation to the nature of the objective. The first restructured course included the following study sessions: 1 hour per week — general assembly session; 1 hour per week — small assembly session; and variable hours per week — independent study session, a modification of the original audiotape tutorial.

Recently, an integrated quiz session has been substituted for the small assembly session. It is a modified seminar and oral quiz and involves eight students seated informally around a table with one instructor. The instructor is supplied with the various items which were included in the learning center the preceding week and uses them as a basis for student discussion. All students are asked to discuss items in a specified pattern or format: (a) the item is to be identified; (b) the student is to tell its role in the week's work or objectives; and (c) the student is to explain how it fulfills this role. These items include a great variety of materials such as plant specimens, a microscope, 2" x 2" slides, diagram or chart, a time-lapse movie, all or parts of experimental equipment, or any other materials which have been used as subjects of study during the preceding week. Students have an opportunity to add comments concerning the items. These are distributed to students in a sequenced fashion so that the theme or themes of the week are clarified; and progressive relation of each experiment to the next in the week's sequence is retained during the session. This session has been an effective feedback mechanism concerning success or failure of any program sequence of experiments and often provides clues for improving the approach. It also helps to clarify the appropriateness of the communication vehicle used in attempting to achieve the objective. This miniaturized seminar enables many students to see relationships and concepts which were not evident from the independent study session earlier.

In addition, students are asked to do two miniature research projects. Guidance is provided for the first project: the problem is defined, the materials and methods are described, the student is told what data to collect and asked to analyze these data and write up that project in the format of a scientific paper. The second project is completed independently by those students who hope to make an "A" in the course, and here the student is restricted only by the materials available to him. He defines the problem, decides on the experimental procedure, what data to collect, analyzes these data, and writes up his project in the form of a scientific paper.

As a final assignment, a problem is defined for an experiment requiring 2 to 4 hours and is done in the independent study session under the audio-tutorial system as well as the conventional system. The subsequent levels of inquiry also are handled effectively in the independent study session. The results of the audio-tutorial system have been positive from every point of view. Better instruction can be given with equal or less staff and space. Grades and student interest have improved at all levels. Costs are reduced for equivalent levels of instruction.

Supplemental Audio-Tutorial Program
Liberal Arts and Cooperative Engineering Curriculums
Roger Williams Junior College, Providence, Rhode Island
Absalom F. Williams and Walter R. Hobbs, Jr.

There is a definite need at Roger Williams Junior College to adjust courses for the diversity of background of students. The College searches continuously

Photo by Therold S. Lindquist

A program in crystallography is one of several sequences located in nonequipment study carrels at the State University of New York, College at Fredonia.

for the best ways to help students develop their own ways to think clearly, logically, and independently.

New course operations for the coming semester are being drawn up. Patterned after Postlethwait's work in botany at Purdue University, the program will operate in both biology for liberal arts students and physics for cooperative engineering students. Students will teach themselves, use of the newest techniques in training aids will be made, and a meeting point for students and staff will be provided around which their mutual efforts may be fruitful and beneficial. Perhaps the last point will become one of major importance. Students will be involved throughout the study in the planning and production of tapes and films for this program.

These efforts perhaps will not be adaptable to the Roger Williams student population. Thus it is not planned at present to provide a considerable installation of study carrels and machinery. If experience shows that these new methods do indeed help students and enhance the teaching operations in a significant manner, the opportunity will be expanded, perhaps through portable facilities.

Along with these plans for making use of new media are plans for coordination of class meeting times for lecture, laboratory, and independent study within the carrel itself. There will be the opportunity for several exposures to the same kind of materials on different levels of operation. Essentially, it will be a matter of explanation, practice, and review.

Independent study in the carrel provides each student the opportunity to clarify confusing points from previous work, to take self-administered conventional quizzes, available in the carrel, and to think along specific lines with guidance. There should be a great variety of learning opportunities and events. These events are programed by means of two guides — the 8mm color film cartridges and the audiotape provided for each carrel. Each carrel will be equipped with other items such as a microscope, live specimens, sample pulleys and weights, or other kinds of materials. Material which is too bulky to be placed in the carrel will be placed on a central demonstration table, and students will be guided to use this material by suggestion from the instructional tape.

A student is led, or tutored, through successive series of teaching-learning events by the instructor in the lecture periods. Experiences such as reading preparatory materials, comparing specimens or apparatus with diagrams, examining important data, completing laboratory exercises and other appropriate activities will be assigned. Every useful conventional teaching-learning activity found in other methods can be put to work in this audio-tutorial situation developed by Postlethwait.

Individual experiences, or even research projects, are much to be desired in this framework. Suggestions will be given, time to facilitate such operations will be made available, and instructional time will be devoted to promote research organization. With succeeding experiences in research, more latitude is left to the individual student to provide the ideas, the methods, and the solutions.

It should be definitely emphasized that these methods are not planned to eliminate the instructor from the classroom in any way, or to reduce personal instructor-student contact. Rather it is assumed that each instructor eventually will be relieved of some routine duties and thus will be able to give attention to individual problems. This will be an experimental program for some time to come, and methods are bound to change as further information is acquired and put into operation. It is hoped that other instructors in other departments in the College will join in these efforts to adjust courses on an experimental basis for students of differing abilities and backgrounds.

Self-Instruction Center
Southern Illinois University, Carbondale

Donald L. Winsor and Harry Denzel

The Self-Instruction Center was established at Southern Illinois University in March 1966 on a trial basis to ascertain if some pressing needs of students could best be met through such a facility. There were two audio-tutorial laboratories: one in art history and the other in biology, both operating since the previous September. The Center is located in a classroom and houses 24 "homemade" carrels and three additional tables available for individual student work areas.

At the beginning it was planned to utilize primarily commercially available programed instructional material, mainly in book form. A wide variety of suggested material was ordered to familiarize the staff with what was available, to enable the faculty to evaluate and become acquainted with what was being produced, and particularly to serve as a starting point of support for students in a variety of areas. This effort is now supplemented by a variety of other approaches. More than 100 students use programed taped material in the foreign language area for practice and for meeting language requirements. Taped copies of lectures in 17 courses are provided for student review purposes and for those who miss the lectures as they were presented. Combination audiotape 2" x 2" slide series support some of the current large-group instruction. Through the Self-Instruction Center 16mm films are available to students to use for review and preview purposes.

The audio-tutorial system referred to above is serving a comparatively large number of students: 500 students in art history and 200 students in biology. In the art history course self-contained slide projectors are being used in conjunction with tape recordings, lecture notes, and discussions. In the biology course, tapes are being used in combination with 8mm single-concept films, 2" x 2" slides, laboratory materials, and models.

A number of projects will be explored in the immediate future. The first of these will incorporate three image 2" x 2" slides in combination with a videotape lecture in a design course in the general studies program. The course, offered for credit, will be available to students at their own rate of progress. A random-access system is being considered as an initial step toward establishing a more complete and extensive system. Sixty-four channels will be available for 30 stations initially, with future planning envisioning availability from both on-campus and off-campus locations.

A final objective in this developing system is perhaps one of the most encouraging steps. The Self-Instruction Center is being used on a trial basis. Upon successful completion of a trial period, a permanent center would be established to be operated by the appropriate department.

Shortly after the establishment of the Self-Instruction Center an advisory committee was established to provide direction and guidance and function as a sounding board for the Center. This committee has proved to be a most valuable contributor to the development of the Center.

The Self-Instruction Center is under the direction of the Instruction/Learning Resources Service, as is the operation of the multimedia building on campus. Joint planning has increased tremendously so that, as large-group instruction is developed, complementary material also is developed for small groups and for use at the Self-Instruction Center. This has provided faculty members with a variety of approaches to facilitate improved instruction.

In summary, some data will perhaps best illustrate developments during the short life of the Center. During spring quarter there were 400 visits and 58 regular students utilizing the services of the Center; during summer quarter, 1,700 visits and 208 regular students; during this fall quarter, 2,024 visits and 296 regular students. These students have come to the Center because they were referred by an adviser or by a faculty member, through information put out by the Center, and, most important of all, because other students felt the Center provided a needed service for them.

Self-Instruction in Audiovisual Operation
University of Colorado, Boulder
Otis McBride

Checkout on equipment operation has been a time-consuming operation for the instructor in the beginning audiovisual class for many years. In the fall of 1966, nine carrels were set aside in the East Reading Room of the library. The following equipment was stationed there, one piece of equipment in each carrel: tape recorder, record player, 2" x 2" filmstrip projector, Technicolor 8mm cartridge projector, overhead projector, opaque projector, 2" x 2" individual small viewer, filmstrip individual small viewer, 16mm motion picture projector.

A manual for the particular pieces of equipment was placed in each carrel. Necessary items and materials were placed at the Reserve Desk: practice film; headphones for tape recorder, record player, and 16mm projector; cartridge for 8mm projector; tape; disk.

The library is open from 7:30 a.m. until midnight. During those hours students and faculty are invited to go in to learn to operate equipment.

The carrels are at the end of the large East Reading Room. This arrangement has worked in a very satisfactory manner so far. The only equipment that might create excessive distraction is operated with headphones.

This arrangement provides opportunity for lengthy study by people interested. Perhaps most important of all, it is a good start toward development of more elaborate carrel participation. Plans are already under way to move the University-owned filmstrips to the Reserve Desk for checkout and use of this equipment. It may be possible to make all the tapes available through some similar arrangement, and eventually by a dial system.

The School of Engineering is initiating experimental study of carrel utilization in its own organization, beginning with four carrels. These carrels, so far, are equipped each with a tape deck, record player, an 8mm single-concept projector, and a filmstrip 2" x 2" slide projector. Closed-circuit television will soon be added.

n Audio-Tutorial Approach in Life Science
ncennes University Junior College, Vincennes, Indiana
Warren Potter

In 1966-67 Vincennes University Junior College introduced several audio-tutorial programs via a grant rom the Higher Education Act of 1965, Title VI-A. wo departments are involved, and programs have een instituted in basic English and in the life sciences to include biology, botany, and zoology. (All re five-semester-hour courses except English, which s three-semester-hour credit.) The Purdue-Postlethwait method of teaching is being followed*, using maximum flexibility to fit the special needs of the Junior College and its students.

Physically the program in the biological sciences consists of the following components:

- A 1-hour general assembly session per week. The function of this session is to review, introduce, or test the various topical units.
- A 1-hour oral quiz session held in groups of 8 or 10 students weekly.
- A laboratory equipped with 16 carrels, a small projection booth, and ample demonstration areas. The carrels are basically equipped with a Roberts tape player Model 1700 on which taped "conversations" about the week's unit are placed.

At the date of this writing, no correlations or statistical associations have been made; however, we do make these generalizations pending further study:

- The students are eager for the opportunity to schedule their own time in the laboratory and seem to do better in their other courses as well as in the life science offerings; however, immaturity does cause some problems, and guidance is necessary for this group of students (supervised study, written assignments, minimum number of hours to be spent in the laboratory).
- Though it is desirable to keep scheduled contact hours to a minimum, it is helpful to have review sessions for those students desiring further instruction on the week's unit.
- A well designed study guide seems to be the one most important part of this type of study. It should contain an outline of the taped lesson, the vocabulary necessary for success with the unit, the concepts, and the skills required for satisfactory oral quiz and exam performance.

In summary it should be said that the audio-tutorial approach is unexcelled in areas where scheduled laboratory populations exceed 24 students. Even if small laboratory sections are possible, one must consider the advantages of this method for the student. Administratively one must also consider that a larger number of students can be effectively taught in a smaller laboratory space by this method. Staff and budget demands are about equal to that of the conventional approach. Better staff and student morale also seems to be a result of this approach.

An Innovative Program in Basic Communications
Vincennes University Junior College, Vincennes, Indiana
Harriette Groscop

The essence of the philosophy of Vincennes University Junior College is the provision of educational opportunities for all. A corollary to this philosophy is its admissions policy: "All graduates of regularly commissioned high schools will be admitted to the freshman class." As a natural consequence of this democratic policy, some 50 percent of the University's entering freshmen test below the fiftieth percentile on the ACE test. In general, students in the low scoring bracket lack motivation, especially in the vital area of communication skills, despite their previous exposure to conventional training methods.

In seeking to give individual attention to the large number of poorly motivated students, the College has combined several experimental techniques in the methodology of teaching remedial English to develop an innovative program. The 3-hour nontransfer credit course consists of three weekly and one biweekly study sessions: (a) a general session presented by closed-circuit television, (b) an audio-tutorial laboratory session, (c) a writing and discussion session, and (d) an individual counseling session.

For the general meeting, students assemble weekly in nine classrooms equipped for TV viewing. The purpose of this session is to present general information pertinent to the lesson and to unify the course. The presentation takes the form of illustrated lectures by the senior professor or a guest lecturer, or of panel discussions, with the panelists being students of the class.

For the laboratory study, 27 groups of approximately 25 students meet weekly in the newly established English laboratory, equipped with 30 carrels, 30 tape players, 2 tutorial film machines, and multiple copies of 4 programed English textbooks. Students listen to taped lessons and work on programed lessons correlated to the tapes prepared by the senior

Photo by
Isago Isao Tanaka

Listening assignments, like reading assignments, range throughout the curriculum of the College of San Mateo (California).

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* *New Media in Higher Education*, pp. 126-30.

professor. The tapes, which reinforce the lessons introduced and outlined in the general sessions, cover topics pertinent to communication, such as paragraph completeness, methods of development, using phrases and clauses, coordination and subordination, diction, elimination of gross errors, the whole essay, and writing about literature. The average student spends from 25 to 35 minutes on the taped lessons and works the remainder of the 50-minute period on his individual problems in English.

For the writing and discussion sessions, small groups assemble weekly to write themes, to take oral and written quizzes, and to participate in group discussions. These sessions are conducted by English assistants, each of whom leads three groups a week.

For the individual counseling conferences, students report biweekly to their respective writing and discussion leaders. During the 20-minute conference, the counselor evaluates the student's written work and assigns materials in the laboratory for individual study.

Since this is an innovative project, it is difficult at this time to evaluate objectively its significance. An objective evaluation is planned, however, on these bases: (a) pretesting and posttesting (two forms of the ACE test); (b) a comparative study of semester grades of basic communications students during a 4-year period (the first year of which the course was taught in the conventional classroom manner, the second and third years of which it was taught in a 3-hour TV classroom manner, and the fourth year [1966-67] of which it was taught in the foregoing described manner); (c) student evaluation; (d) instructor evaluation; and (e) a follow-up of the performance of the presently enrolled students in a subsequent college-level English composition course.

A preliminary evaluation based on the favorable response and apparent progress of the students suggests the probable success of the program. It is hoped that the innovative program is meeting the needs of the individual student in basic communications.

Audiovisual Self-Instruction Laboratory

Wichita State University, Wichita, Kansas

Carol S. Holman

A 5-week-long emphasis on audiovisual education, combining a self-instructional program with lecture-demonstrations each week, is a part of the educational psychology area of study, usually taken in the junior year of the teacher training program. The lecture-demonstrations are given during 50-minute periods scheduled in a classroom in the Audiovisual Center.

The self-instruction laboratory is located adjacent to the Curriculum Library in the Education Center. Each of four stations has a 41-inch projection cart with built-in locked storage containing a manual, tape recorder, slide/filmstrip projector, 16mm film projector, slide viewer, two pairs of headsets, practice and instructional tapes, slides, filmstrips, and 8mm and 16mm film.

Self-instruction in the operation of audiovisual equipment is logically developed, and practice in using the equipment in the successive steps is planned as follows:

First session. The student teaches himself to operate a tape recorder by following the manual, which contains a step-by-step procedure illustrated with pictures.

Second session. The student finds directions on tape for operating the slide projector; a set of slides, to be used in the slide viewer, accompanies the taped instructions. The student then learns how to operate the filmstrip attachment by using a set of slides and the manual.

Third session. The operation of the 16mm motion picture projector is taught by use of manual, threading chart, 35mm slides, and 8mm single-concept instructional films.

Fourth session. The student makes a 2-minute tape talk, reporting on audiovisual ideas gleaned from his reading of two audiovisual resources (books or periodicals). The fourth week's self-instructional period is spent in the production area of the Audiovisual Center. Here the student makes two teaching aids — one for use on an overhead projector and one which may be used in the opaque projector or on a bulletin board. He uses the overhead and opaque projectors as he shows his teaching aids to the instructor and discusses his objectives in preparing them. The aids are evaluated at this time and immediately returned to the student.

Fifth session. The student is tested on operation of slide, filmstrip, and 16mm projectors by the laboratory supervisor, a graduate student. The Audiovisual Proficiency Checklist is then completed by the teacher of the audiovisual education class; in addition to rating on operation of equipment, the overall rating includes evaluations on the tape talk and the two teaching aids which have been prepared.

During the third year of operation of this program approximately 500 elementary and secondary students in teacher training will complete this program.

Students generally have indicated that their audiovisual training thus experienced has been meaningful to them, although it is somewhat hurried and limited. Additional study and experience in audiovisual techniques is possible through special projects, work with videotape presentations, and audiovisual workshop sessions. The students are encouraged to make use of the Audiovisual Center while they are on campus, particularly during their semester of student teaching when they have a need for locating materials and previewing, listening to, and preparing teaching aids.

INSTITUTIONAL INVENTORY

Indiana State University, Terre Haute. Media laboratory provides 21 stations where prospective teachers learn use of AV equipment, via campus-produced 8mm slot-loading films. (Russell McDougal)

Meramec Community College, Junior College District of St. Louis — St. Louis County, St. Louis, Mo. Audio-tutorial approach in biology has been used with more than 700 college biology students; general chemistry is scheduled for early introduction of this technique. (Walter E. Hunter)

Oakland Community College, Bloomfield Hills, Mich. Postlethwait model is the basic instructional system at Oakland Community College, throughout the curriculum. (Albert A. Canfield)

Oklahoma Christian College, Oklahoma City. Each student rents a carrel study-space in the library, with 136 audio channels available, plus projectors and all library facilities. (R. Stafford North)

Oklahoma State University, Stillwater. A Postlethwait setup in botany, physics, and zoology. (J. C. Fitzgerald)

Oregon State University, Corvallis. Self-Learning Center in School of Forestry provides its own audiotapes and slides; tape lectures for special purposes (instructor absence, student makeup, guest lecturer). (Robert R. Reichart)

Pennsylvania State University, University Park. In experimental procedure, one mode presented entire content of AV course, including equipment operation, with no instructor present. Self-instruction was equal or superior to other methods measured, though not outstandingly so. (G. M. Torkelson)

Principia College, Elsah, Ill. Audio-tutorial tapes request students to pick up specimens, direct their examination and notetaking, and so involve them with materials. One conventional lecture a week, and several field trips during a semester. System increases amount of geological laboratory work done by students. (Forbes Robertson)

Purdue University, Lafayette, Ind. The original audio-tutorial model is based on 2 guidelines: (a) learning requires active involvement of the learner, and (b) opportunities should be provided for repetition, concentration, multisensory learning, use of a medium appropriate to the subject, sequencing of activities, and interaction with fellow students and instructors. Emphasis is on directed independent study. (S. N. Postlethwait)

Roger Williams Junior College, Providence, R.I. Supplemental audio-tutorial program in liberal arts and in cooperative engineering, on a portable and experimental basis — patterned after and adapted from Postlethwait model. (Absalom F. Williams and Walter R. Hobbs, Jr.)

Southern Illinois University, Carbondale. Is in experimental stages with 2 (art history and biology) audio-tutorial setups and a campus-wide Self-Instruction Center for individual use (nonassigned). (Donald L. Winsor and Harry Denzel)

State University of New York (SUNY), College at Brockport. Audio-tutorial program in biology based on a commercially developed systems approach. (Jack B. Franz)

SUNY, College at Oneonta. Spring 1967, economics course makes two 8mm cartridges of each videotaped lecture; experimental group of 60 students will get entire course on these 8mm cartridges in library carrels. (Sanford D. Gordon, F. Brooks Sanders, and Foster Brown)

SUNY, College at Potsdam. Uses 10 AV carrels, with each containing continuous audiotape, 2 slide projectors, and a single-concept 8mm projector, to be used with workbooks. (Robert C. Henderhan)

Syracuse University, Syracuse, N.Y. Center for Instructional Communications operates a self-instruction laboratory in the use of standard AV equipment. As many as 200 students have gone through the program in one semester, of whom 91.7 percent were rated as satisfactorily competent. (Donald P. Ely)

University of Arizona, Tucson. College of Pharmacy uses displays and visual aids developed by students as stimuli for self-instruction and for presentations to alumni in refresher courses. (Richard F. Childs)

University of Colorado, Boulder. AV division uses a series of carrels in the main library for programed self-instruction in use of AV equipment. (Otis McBride)

University of Connecticut, Storrs. Equipment operation laboratory includes 12 student stations equipped as electronic carrels. Used by preservice teachers for self-instruction, to learn operation of basic AV equipment units. (Carleton W. H. Erickson)

University of Dubuque, Dubuque, Iowa. Carrels for AV techniques combine typed guides, filmstrips, audiotapes, with practice equipment. (Charles W. Tyrrell)

University of Oklahoma, Norman. A completely automated AV equipment laboratory requires 18 hours of work on 5 pieces of equipment for all prospective teachers. Performance check by graduate assistants. (W. R. Fulton)

University of Pittsburgh, Pittsburgh. Co-inventor of "ERE," the Edison Responsive Environment. Popularly known as the talking typewriter, this instrument has been used for 5 years in research with children. Designed to (a) permit learner to explore freely, (b) be self-pacing, (c) inform learner immediately of consequences of his actions, (d) permit learner to make use of his capacity for discovering various kinds of relations, and (e) assist learner in making a series of interconnected discoveries about the physical, cultural, and social world. (Omar Khayyam Moore)

University of South Florida, Tampa. Self-instruction booths for operation of AV equipment; student receives instructions on how to thread a filmstrip projector by playing an audio tape on a tape recorder he has just learned to operate. Approximately 300 students complete the course each trimester. (Richard Cornell)

University of Texas, Austin. Each day introductory chemistry students phone in questions, which are discussed and organized by graduate students; answers are broadcast by graduate students on the University Station. (Howard F. Rose)

University of Washington, Seattle. School of Dentistry uses slides synchronized with audiotape (video sonic system) to facilitate student review. (Boyd F. Baldwin)

University of Wisconsin, Madison. Articulated Instructional Media Program (AIM) provides independent study via correspondence, taped lectures, and articulated courses combining text, program, tapes, microviewer, and filmstrips, (Barbara W. Newell)

Vincennes University Junior College, Vincennes, Ind. Programs in basic and remedial English and in biology, botany, and zoology, according to Postlethwait model. (E. Warren Potter and Harriette Groscop)

West Chester State College, West Chester, Pa. A 26-station self-instructional laboratory for students in all sections of basic undergraduate AV education includes supervised self-instruction in production of multipurpose sensory aids and in operation of standard AV equipment. (Arnold Fletcher)

Wichita State University, Wichita, Kans. Self-instruction in AV for future teachers includes sequence of experiences on recorders, projectors, and material preparation. (Carol S. Holman)

Wisconsin State University at Whitewater. Auto-instructional laboratory to teach prospective teachers equipment operation and graphic techniques. (Roland P. Schlieve)

SUMMARY

In less than a decade the audio-tutorial model of instruction has been introduced into more than 50 colleges and universities, including several junior colleges that use it as the basic pattern of instruction in all disciplines. Both instructors and administrators, as well as students, are reported to be pleased with the learning effectiveness of the technique. Several qualities of the method seem to explain the success of this innovation in methodology.

The method requires *active participation* of the learner, more explicitly and consistently than other patterns of college teaching have done. It permits the student to proceed at *his own pace*, to study when he is ready to concentrate on the task, and to repeat an experience as often as he feels is necessary for mastery. It provides a *variety* of modes of learning — large-group meetings for information, motivation, and assignment; small integrated quiz sessions for intensification, review, and evaluation; and opportunity for individual face-to-face interaction with a tutor in the laboratory. At these times, also, a variety of learning opportunities are provided — listening, doing, observing, reading — in a planned sequence directed by the instructor. Finally, the method seems to restore the intensified personal contact that has been lost as institutions have grown. Each student is well known by at least one instructor in each course and has the opportunity to know at least one instructor very well.

The editors are confident that the combination of learning opportunities that organizes both traditional instruction and self-instruction through new media into a planned and tested unity will grow in acceptance and in effectiveness over the next decade.

VIII

COMPUTER-ASSISTED INSTRUCTION

WHILE the use of computers in college and university administration has now become rather commonplace, their actual use as adjuncts to instruction at that level (the primary concern of the HEMS staff) appears still to be quite rare and largely experimental.* The growing importance of computer-assisted instruction in higher education may be estimated from two recent publications. One was prepared for the American Council on Education and is titled *Computers on Campus***; the other is the Report of the President's Science Advisory Committee, *Computers in Higher Education.**** Both devote chapters to consideration of computers in course work.

One special instructional use of computers is found in some listening laboratories (discussed earlier) equipped with random-access facilities involving remote stations. Special-purpose digital computers are commonly part of the switching and recording hardware for such installations. In these arrangements, however, computers do not communicate directly with the students.

Still another instructional computer application is found in the student response systems installed in several multimedia classrooms observed in various parts of the country. There, the computer provides the instructor with immediate indications of the percentages of students who respond to each possible answer in a multiple-choice question. In some multimedia room installations, provision also is made for a computer connection, usually on a time-sharing basis, that will provide the instructor with a rapid print-out of individual student performance on each item in a series of questions, and with an item analysis of each question answered through the student response system. With this information, it then becomes possible for the instructor both to adapt his later presentations to meet any inadequacies revealed by the data and to recommend individually prescribed learning exercises for students whose performance shows they require them.

Another form of computer-assisted instruction, a type of individualized instruction making use of dialogue between a student and a computer, was described in *New Media in Higher Education.** The program there described, the PLATO (Programed Logic for Automatic Teaching Operations) project at the University of Illinois at Urbana, is still an active and outstanding example of such application. Additional experiments and instructional programs are being developed for it continually. The student console used with this system consists of a typewriter connected to a computer and a small electronic screen. The student communicates with the computer by using one of a series of command keys, or by typing answers to problems posed by the computer and appearing on the screen. The screen itself can exhibit information from two sources: (a) a programed series of slides, with random access as needed by each student; or (b) an electronic blackboard that will show instruction printed out by the computer, responses typed by the student, and reactions of the computer to the correctness of the responses. In a similar experimental installation at Pennsylvania State University, the student console consists not only of the typewriter and TV screen, but also includes a modified sound tape recorder and a modified slide projector, both under control of the computer, and a desk calculator and a Data-Set telephone instrument.

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* The popular press reports widespread activity in computer-assisted instruction in certain elementary schools around the country. The projects involving such use (Suppes' Brentwood-Stanford Project, for example) are usually under the direction of university faculty researchers.

** Caffrey, John, and Mossman, Charles J. *Computers on Campus.* Washington, D.C.: American Council on Education, 1967. 207 pp.

*** Report of the President's Science Advisory Committee. *Computers in Higher Education.* Washington, D.C.: Government Printing Office, 1967. 79 pp.

* See pp. 108-109.

Perhaps a more usual instructional use of computers is in connection with examinations. The computer has several significant advantages in correcting and in analyzing examination results. It provides the instructor and the student with nearly instantaneous reports on the student's total performance on an examination. In addition, computers can provide detailed diagnostic reports on individual student performances, enabling the instructor to make individual prescription of study activity for each student; test items can be evaluated and improved in a similar way, after it is known what proportions of students in each significant segment of the distribution of scores answered questions correctly.

Although the Media Study has been primarily interested in instructional applications of new media, several other kinds of applications of computers to problems of higher education are worthy of mention, because often the same computer can provide services for these purposes as well as for instruction. For example, financial records, student records, and class schedules are processed by computers in almost every sizable institution and in a good many of the smaller ones as well. There are additional established patterns of utilization in library service, information retrieval, and computer science.

One newly developed technique involving use of computers, "Selective Dissemination of Information," is of exciting potential for any group of workers needing to keep up-to-date with the most recent knowledge in specific fields. This technique involves (a) a group of readers who are competent to abstract articles in journals as rapidly as they come out; (b) a computer that can store the abstracts, bibliographical entries, and a series of key call words about each entry; (c) subscribers who can develop a Selective Dissemination of Information (SDI) profile for themselves, including all the key call words about which they wish to be informed. Each week, with this plan, abstracts from the previous week's journals are fed into the computer; the profiles of the subscribers are scanned; and cards are printed giving each subscriber the abstract and reference information for each article dealing with topics in his profile. A given profile might include the names of several colleagues whose work the subscriber wanted to follow, and perhaps 20 or 30 key words that would be likely to appear in either the title or prominently in the abstracts of any article in which he was interested.

The Ames Laboratory at Iowa State University has listed three criteria for an acceptable SDI system: (a) There must be an input of an adequate number of documents and scope of coverage, and relevant materials may be found in more than a few narrow publications within a specialty; (b) the individual user profile needs to be fairly extensive — it takes some time and experience with SDI to develop a complete list of topics that will fit the user's needs to the abstracters' and computer's capabilities; (c) subscribers are happy to receive as many as 30 to 45 notifications each week and will use as many as 10 to 15 documents from the list provided them. In addition to the service on a periodic basis to subscribers, the same SDI system may be used to provide bibliography to the occasional inquirer on a specific topic; e.g., a physician might request articles over the past 2 years dealing with diabetes mellitus. In this case a problem of relevance arises, since such a request might conceivably overwhelm the user with a supply of cards detailing abstracts, but without any evaluation of merit of the article (until the abstract was read) or of duplication of material from one article to another. Although this would be preferable to having to search through all the abstracts in the library, the developers of SDI applications feel that the determination of relevance to the needs of the inquirer is a problem that merits their attention.

In 1966, SDI was available to limited audiences of subscribers in only a few specialties, generally as trial projects supported by grant funds. Users seemed so pleased with the results, however, and economic indications are sufficiently favorable, that it seems safe to predict that within a short while commercial SDI systems will become available to faculty members, researchers, industrial workers, and students in a much broader spectrum of academic disciplines.

Colleges and universities with access to a computer of any type, even one that was installed primarily for administrative purposes, frequently offer courses in computer programing and data processing for students in mathematics and engineering. Often, a second stage of this use is to invite students from all departments to learn a programing language (usually, as reported, Fortran) and to use the computer on an "open-shop" basis for problem solving and undergraduate research in such varied fields as political science (opinion research), chemistry, physics, biology, economics, business administration, and engineering. One college invites high school seniors to come to campus at 7 a.m. to learn programing either as an occupational skill or as a tool of value to them when later they become college students. It seems probable that within a few years many high schools will offer such introductory courses in data processing as part of their vocational curriculum.

Libraries use computers for circulation control. With such facilities, a punched master card carries information about each volume, and a copy of it remains with the volume at all times. When the book is charged out, additional cards are produced with the due date and the user's identification number. One of these stays in the library and is processed when the book is returned. In this manner, a constant record is available, perhaps in several offices, of the whereabouts and due dates of each volume of the library holdings.

Computers also are used to provide multiple copies of library catalogs. By means of the punched master card file, it is possible to produce multiple print-outs of a subject file, author file, and title file, on the usual computer print-out sheets. Copies of these catalogs can be distributed, at some cost, to the offices of each school or even department of the institution. The convenience of having a portable catalog in several campus locations, in place of the cabinets full of cards in the traditional library catalog room, seems to be a strong argument for the reported additional cost of the printed catalog, annually reproduced and supplemented by weekly reports of acquisitions, cumulated regularly.

CASE DESCRIPTIONS

Selective Dissemination of Information

Ames Laboratory of Iowa State University, Ames

George C. Christensen

The Ames Laboratory began work designing and implementing a Selective Dissemination of Information (SDI) system for scientific personnel late in 1962. It was felt that four criteria had to be met with the initial design: (a) The system had to be flexible to accept and adjust to any available machine readable form of document input. (b) The users were to be totally responsible for their profiles, yet the system had to have the programed ability to alleviate as much user intervention as possible. (c) The programed system had to be designed so that no theoretical limits could be placed on the number of users or of documents, and yet had to be relatively economical to run. (d) The system would serve as a laboratory for studying the complex problem of accurate dissemination and retrieval of information.

Two basic experiments were conducted to measure the potential effectiveness of the SDI system before the programed system was ready for service. The purpose of the first experiment was to measure the effectiveness of the SDI increment-decrement function. The second experiment was to measure total systems performance using small controlled sample sizes of users and document entries.

From the results of the first experiment, it appeared that the increment-decrement function was quite effective except for the slow increment function. Consequently, a new slow increment function was substituted. The results of the second experiment indicated that the system was sensitive to various types of document composition (e.g., author and title only, keywords, abstract, etc.) and adapted to these to provide optimum performance. If the type of document composition changed from run to run, the system continually adapted and could not produce optimum results. In a later experiment, the threshold was lowered for the less descriptive source documents, based on numeric ratio of words, intuition, and an "educated" guess. It was determined that SDI profiles could adapt successfully to various composed documents. It was felt at this juncture that the SDI system was ready for production. A peripheral experiment was conducted at the same time attempting to measure the effectiveness of dynamic (user feedback) and static (manual user) assignment of word and word group significance of profile terms.

The SDI system went into service in January 1965 utilizing one source of document entries, *Nuclear Science Abstracts*. After several runs were made utilizing this source of input, various complaints concerning narrow subject coverage were received. To compensate for this deficiency *Science Citation Source Index* magnetic tapes were purchased from the Institute for Scientific Information in July 1965. A total of 177,180 document entries (six-month coverage of literature) were scanned from January 1965 to January 1966, resulting in the dissemination of 54,018 entries selected for distribution. The results of these production runs were measured statistically and by surveying the users.

Because the measures employed were conducted in a live university research-oriented environment it was felt the results were quite valid. The sample size in terms of numbers of document entries was large, and it is doubtful if a larger sample size would have altered the results unless the document coverage of the subject matter related to the user was more or less extensive. There was a definite correlation between the user's satisfaction with the system and the volume of notifications generated for him and the size of his profile. This correlation indicated two important points: (a) A user does not consider 35 to 40 notifications per week too many to look at; he can find a use for as many as 10 to 15 documents of interest per week (with the particular source documents scanned). (b) The selection of scientific literature is a communication process between an individual person and his field of endeavor. A user will expend a concerted effort in developing effective profiles if he desires a successful communication process.

With Iowa State University's acquisition of an IBM 360/50 computer and the removal of an IBM 7074/1401 computer, the entire SDI software system (14 production programs) was rewritten in COBOL-E (7074 system was written in IBM AUTOCODER), but the basic software systems design is similar to the 7074 version. Various minor modifications have been made to economize transfer of information as a result of experience gained from the previous system. Extensive revisions have been made, related to peripheral operations, to alleviate computer operator and clerical dependence. Statistical indicators have been built into the system which were manually derived or not available with the previous version.

Computer-Assisted Instruction Center, Remote
Centre College of Kentucky, Danville
John W. Frazer

While Centre College is committed to highly personalized instruction for capable students in a residential setting with a student body not to exceed 1,000, it feels that it is absolutely necessary to relate the technological progress of the twentieth century to undergraduate higher education and the learning process. As a consequence, the College is engaged in an extensive study in the use of programed instructional material which it will design in two areas: (a) an experimental interdisciplinary team-taught course now being developed, which consists of topics traditionally covered in chemistry and in physics; and (b) a standard course in elementary German.

The principal thrust of the experimental development work will be in the "Chem-Phys" area. The secondary thrust will be in elementary German. The levels of effort are introduced to ensure maximum use of computer time available. The remote station will be a Western Electric 103 A-1 Data Set, connected to a 1400 series IBM computer currently located at Florida State University in Tallahassee, Florida.

The Chem-Phys course was first designed for a National Science Foundation program for outstanding high school students and teachers in the summer of 1964. Favorable response has led to its adaptation on an undergraduate level.

The course consists of topics traditionally covered in chemistry and physics. It illustrates in a meaningful way the advantages of the sequence of physics followed by chemistry over a typical traditional sequence of chemistry then physics. The topics are introduced in such a way that one leads to the next in a logical and useful way. As a result, one can present molecular structure and chemical bonding with a quantitative approach and with a depth of understanding which would not be possible without the background material presented from physics. The course has been developed on a thematic approach. Molecular structure was chosen as the unifying theme, and the disciplines of physics and chemistry have been brought to bear on the problem of the theme. Many of the traditional topics of both physics and chemistry not covered in this course can be taken up in later courses when needed.

A team of three members of the science faculty will attempt to develop finite modules of programed instruction related to specific topics within their special field of competence. The day-to-day feedback of effectiveness of the sequence and type of individual student response will be studied and analyzed with two objectives in mind: (a) to determine the effectiveness of particular sequential groupings in the instructional process so that the text material being prepared in the molecular structure vehicle of study for chemistry and physics can be most effective, and (b) to examine more realistically the thought process or logic of learning as it relates to the most effective learnings of individual students.

The German effort will be in a normal freshman-level undergraduate German course which has normally been handled in the traditional manner with three class meetings per week and ample homework. The current language laboratory facility adds one additional meeting to the course each week. Laboratory work is concentrated on pronunciation and vocabulary building and certainly contributes to an improved performance in these areas. However, an additional development which can improve student performance is the use of programed materials for instruction in grammar. Such materials, which are being developed as a complement to all laboratory practice, will be more useful on an individual student basis and will release class time for more systematic inquiry into the ethos of the German culture. As in Chem-Phys one or more topics selected from a topical outline will be selected to furnish a point of concentration. The daily feedback will be analyzed and studied in the same way suggested earlier for Chem-Phys with emphasis on both effectiveness of the programed material and individual student method or logic of learning.

Computer-Assisted Instruction Laboratory
Pennsylvania State University, University Park
Harold E. Mitzel

The Computer-Assisted Instruction Laboratory at Penn State was organized for the purpose of engaging in research and development activities connected with the application of computer technology directly to instructional processes.

The equipment in the CAI Laboratory consists of eight student terminals connected by means of telephone lines to a medium-sized computer, IBM 1410, located at the PSU Computation Center. Four terminals are located in 201 Chambers Building, two terminals at Penn State's Commonwealth Campus in Altoona, and two terminals at the Williamsport Area Community College. Each student terminal unit consists of an electric typewriter, a modified sound tape recorder, and a modified slide projector. All components are under computer control and are activated by a program of instruction stored in the computer's central processor. A desk calculator and a telephone instrument called a Data Set round out the equipment configuration for the learner.

Beginning in April 1964, the initial objective of the first project of the CAI Laboratory was to test the feasibility of simulating the tutorial teaching model in providing college-level instruction under control of a high-speed computer. To this end, faculty members at Penn State, using Coursewriter language developed by IBM computer scientists at the T. J. Watson Research Center, Yorktown Heights, New York, devoted their efforts to preparation of educational materials which would supplement lecture and discussion activities and would be presented to students via an IBM 7010 computer located at Yorktown Heights. The main outcome was the development of four college-level courses: audiology, cost accounting, engineering economics, and mathematics. To ascertain the effectiveness of instructional programs, student performance on the programs was constantly evaluated, and prior to completion of the courses for CAI presentation, pilot investigations were conducted and preliminary evaluations made.

During the spring and summer terms, 1966, a field trial was conducted for the four college courses. One class section of students, taken from registrations for each of the four courses, was assigned at random to one of three experimental treatments; one treatment included the presentation of course materials to students at the student terminal in addition to meeting with the professor one class period per week. During the field trial, by means of a process of record keeping known as *Student Records*, student responses, response times, and additional data were stored in the computer. Another instrument developed and used at periodic intervals for this investigation is a *Student Reaction Inventory*, which is a self-report rating on computer-assisted instruction by student subjects. A retention test was administered during the following term to all three groups in each of the four classes.

Three additional projects have been undertaken at the CAI Laboratory. The first is an extensive investigation into the ways of improving preparation of course materials for presentation by computer in technical education. Course segments in communication skills, technical mathematics, and engineering science have been prepared and are used as a basis for experiments with learners. The second study deals with an attempt to develop a computer-based system of providing occupational information for ninth- and tenth-grade high school boys. The third study utilizes the Laboratory's CAI course in modern mathematics for providing in-service education to a group of 50 elementary teachers in the Williamsport Area School District.

Test Construction, Analysis, and Scoring Services
Pennsylvania State University, University Park
Leslie P. Greenhill

As a result of growing college enrollments and also because of a better understanding of the many kinds of learning that can be measured reliably with "objective" examinations, increasing numbers of faculty members are turning to the use of such examinations to assess the performance of students in university courses. In order to aid the faculty in the development of objective tests and in the scoring, analysis, and improvement of such tests, Pennsylvania State University has established an Office of Examination Services.

Professional staff are available to assist the faculty in analyzing course objectives and developing appropriate measures of student performances (these may include essay, laboratory performance, and oral tests as well as objective tests). For objective tests the Examinations Office provides a test scoring service which employs a Digitek optical scanning test scorer, which will score up to 2,500 tests an hour with a high degree of accuracy. From students' answer sheets the machine also will keypunch cards which can be fed into a computer.

The computer has been programed to print out for each examination a Total Test Summary which alphabetically lists examinees with their student numbers, the raw scores and converted scores on the test, a plotted frequency distribution of scores, an estimate of test reliability, test mean and standard deviation, test range, standard error of the mean and skewness of the test. Another program will summarize the performance of students in several tests in a course over an academic term. A third program has been designed to obtain item analysis data which can be used to evaluate test questions, with a view to improving objective examinations.

The Office of Examination Services assists faculty members in development of test questions, writing of test directions, validation and prediction studies, and the development of test norms. This service also has developed a course attitude questionnaire to assess students' attitudes toward various aspects of instruction. A scoring and analysis service also is available to process responses on these questionnaires.

The rapidly increasing use made of these services by the faculty testifies to their value.

Computer Output in Motion Pictures
Polytechnic Institute of Brooklyn, New York, New York
L. Braun

The combination of a digital computer and a cathode ray tube has now been used for several years for the output of computer results in graphical form. The ultimate in this process has been to view computer output as a movie.

Although developed for scientific data assimilation, such movies have great educational potential. Typically, the animation desired in science education movies is described by precise mathematical equations. Just this kind of animation is very difficult to do by hand and easy to do by computer. Any scientist knowing Fortran can be his own animator — a fact which promises to enhance communication between scientists and film maker. Perhaps most important of all, computer animation enjoys one of the principal advantages of computing: easy and rapid parameter changes. To reanimate a sequence, say, 1.7 times faster, one needs only to change a single number and rerun the program. By hand methods, the sequence has to be laboriously redrawn.

In spite of these attractions and in spite of great interest among educators, computer animation has had little application to science films. One reason is apparent: the expense of the high-quality cathode ray tube and concomitant electronic equipment. This expense has confined computer animation to large industrial and government computer centers; no university computer center has been properly equipped to do it.

To remedy this lack, the Polytechnic Institute of Brooklyn has acquired, under an NSF Center of Excellence grant, a Stromberg-Carlson 4020 Cathode Ray Tube Recorder, which is being driven by its IBM 7040 computer. It is planned first to establish a production facility for 16mm and 35mm computer-animated films. The SC-4020 runs from a magnetic tape which can be generated on almost any digital computer. Hence, computation of the films can be done on a local computer anywhere. The magnetic output tape containing the computations can be mailed to the Institute for processing into films, at cost. Alternatively the entire film can be computed and processed using the Institute's IBM 7040 and SC-4020 computers.

The PIB also plans to establish an educational and developmental facility in computer animation. A first step is the involvement of several PIB staff members from a wide variety of disciplines (e.g., electrical engineering, physics, chemistry, metallurgy, and industrial engineering). It is expected that a resident cadre will thus be available for further education of associates in like fields in other institutions. In addition to this "in-house" effort, summer workshops and orientation sessions are planned, in which an attempt will be made to bring together professional film makers and scientists in an enhanced partnership for the educational exploitation of a new medium.

Software development will be another important aspect of the computer-animation effort. Here, the aim will be to establish a repertory of computer programs for animation of films in various educational fields.

Computer-Assisted Instruction
Purdue University, Lafayette, Indiana
J. Christopher Reid

At Purdue, a computer-controlled typewriter (an IBM 1050 system) has been put into service and has been used experimentally by a number of interested faculty. Course segments in modern languages, educational psychology, computer sciences, psychology, and engineering are being prepared, and some instructional experiments also are to be conducted. Two commercial compilers, Coursewriter and Fortran II, have been used in writing course segments thus far with good success.

An interdepartmental course has been offered to interested faculty and graduate students so that they may learn CAI techniques and proceed to develop additional CAI uses. The installation of a special and previously unused computer has been completed which will provide an independent local system. This new system will have not only typewriter input-output, but is also expected to have pictorial displays and, in time, some ability to respond to vocal inputs. These extensions of the system's capability are being sought especially for instruction in engineering, speech, art, and modern languages.

Computer-Assisted Instruction
State University of New York at Stony Brook
E. D. Lambe and Richard F. Hartzell

The Computer-Assisted Instruction program at the State University of New York at Stony Brook is a project of the Instructional Resources Center. Teaching programs currently utilize eight IBM 1050 terminals connected by dataphone with an IBM 7010 computer at IBM's research headquarters in Yorktown Heights, New York. An IBM 1500 system with 10 terminals has been installed at Stony Brook for research and development in computer-assisted instruction. Eventually the system will accommodate 32 student stations with a combination of typewriter and cathode ray tube (CRT) terminals with audio and image display equipment.

In a university with a large and increasing enrollment the need is recognized for developing teaching methods which meet the requirements of a variety of student backgrounds. Computer-assisted instruction may provide a means which will aid educators in tailoring instruction to the needs and abilities of individual students. Such a programed teaching system is able to record the individual's answers and vary its responses accordingly.

In addition, the computerized system may be used the teacher and researcher to study the individual ocess of learning because it can store and make ailable learning data amassed while the student udies with the machine. This feedback also allows e teaching program to be modified while in use.

The computerized system may relieve teachers of uch of the burden for close supervision of drill and omework recitation. Problems may be varied in fficulty or type to meet the needs of different stunts. If he desires, the student may schedule more an the assigned time at the student terminal when e has difficulty with a section of the program.

The programs described below are being tested ith a relatively small number of students. Faculty rticipation may include writing, altering, or exanding the programs, as well as evaluating the roper relation between the computer and the classoom.

French. Based on *Basic Conversational French* hird edition) by Julian Harris and André Lévêque. eveloped by Holt, Rinehart and Winston. Testing nd revision by Benkt R. Wennberg, SUNY at Stony rook. Student time at the terminal assigned per eek: two or three half-hour sessions. Tutorial proram including dictation, translation, and transformaion-substitution.

German. Based on *Der Anfang* (revised) by Harold on Hofe. Developed by IBM. Testing and revision y Ferdinand Ruplin, SUNY at Stony Brook. Student ime: two half-hour sessions per week. Written exercise lab with thought-provoking tasks supplemented y listening comprehension and dictation exercises.

Physics. Originally developed by E. D. Lambe, SUNY at Stony Brook. Revision and further development by Paul R. Kramer, SUNY at Stony Brook. Voluntary problem drill. Student schedules terminal time whenever he has difficulty with homework problems designated for computer.

Statistics. Based on *Introduction to Probability and Statistics* by H. L. Adler and E. B. Roessler. Student time: two half-hour sessions per week. Problem drill, recitation, and homework grader. Used in economics and psychology.

Remedial English. Under development by Janet F. Egleson, SUNY at Stony Brook. Student time: 1 hour per week. Written and aural drill in basic spelling, grammar, sentence patterns, etc. Two semesters proposed.

Planned Information System Center

University of California at Irvine

R. M. Gordon

The Information System Center will provide 60,000 square feet for a combination computer-AV/TV center, with resources for housing the mechanical equipment and the information materials, for staff to maintain and operate the system, and for a certain amount of user space, since such a system will be steadily evolving and demand the constructive cooperation of many faculty and other staff members, some input-output consoles, and the facilities for preparing audiovisual materials. Specific spaces included are sound and video production studios; upkeep, editing, and repair service rooms; photographic resources area; simulation laboratories; teaching and related laboratories for testing computer-assisted instruction systems; and classroom space and space for maintaining and charging out the necessary equipment and AV/TV materials. In addition, the faculty and staff of the Department of Computer and Information Sciences will occupy this unit.

The Irvine campus is committed to a major use of new technologies of information processing, to serve all the university functions — education, research, library, administration, extension, etc. This implies bringing together, for maximal effectiveness, several technologies that have developed independently. Computers started as data-processing instruments and have developed so that they now possess extensive logical operation capacity, great internal memories, and the possibility of mobilizing all sorts of external information stores. They also are being improved in hardware and in software (programing for their operation) so as to handle the inputs from many independent consoles essentially simultaneously and so that the user, unsophisticated in computer lore, can "converse" relatively simply. A great central processing unit is planned, connected on the user's side with hundreds of consoles scattered around the campus as well as concentrated in laboratories and, on the information storage side, with microfilm, slides, sound-track film, videotape, and appropriate input devices so that such information can be mobilized at the need of any user at any time.

The PLATO Computer-Based Teaching System

University of Illinois, Urbana

Elisabeth R. Lyman

During the past 6 years (1961-67) the Coordinated Science Laboratory of the University of Illinois has developed and experimented with a computer-based teaching system called PLATO in order to explore the possibilities of automatic instruction. The PLATO teaching system uses a high-speed digital computer to control communication between the students and the system.

Three successive models of PLATO have evolved since the project was originated; each model has contained improvements indicated by the previous model. The third and current model consists of 20 student stations and uses a Control Data Corporation 1604 computer as the central control unit.

Each student receiving instruction on the PLATO system has an individual keyset and TV screen. The keyset allows the student to send information to the computer, and the TV screen presents the information prescribed by the computer program. In most teaching programs the actions of each student are independent, although the system can accommodate interstudent communication. The computer generates visual information in one of two ways: by selecting previously prepared slides from an electronic slide selector with random-access time of one microsecond (each student station can access any slide at any time), or by plotting characters and figures on the student's electronic blackboard. The images from the blackboard and the slide selector are superimposed on the student's TV screen.

The rules that control the teaching process are included in the computer program which is read into the central control unit. A complete set of rules is referred to as a teaching logic. One can program any desired teaching logic into the system by acquiring a brief knowledge of Fortran programing and writing the desired program in PLATO Compiler language, a version of Fortran-60 modified and augmented for PLATO use. Existent teaching logics can be utilized by nontechnically trained teachers who merely provide the slide texts and the appropriate parameters (e.g., page and problem descriptions, branching, etc.) for the specific lesson desired. Many teaching logics contain "author modes" to facilitate editing of lessons. About 20 different teaching logics have been written thus far; the most used types are tutorial and inquiry. A tutorial teaching logic leads the student through a fixed sequence of lesson elements with branching to specialized lesson elements at indicated places in the sequence. An inquiry logic, having presented the student with a general problem, allows him to specify what information he wants and then obtain computer responses to his questions. In this way he can solve the general problem using a strategy of his own devising.

An important feature of the PLATO system is the complete record of student responses which can be obtained. The computer writes on magnetic tape a record of each key that each student pushes, the time at which he pushes it, and the place in the lesson at which the key was pushed. To facilitate interpretation of the instructional responses, the lesson author also has the option of specifying in the computer program the storage of additional information on the same magnetic tape. The stored information can then be processed at any time to yield whatever statistical information is desired. Thus, student achievement, instructional responses, and rate of learning can be examined and evaluated rapidly.

Numerous exploratory studies have been conducted for the purpose of determining the capabilities of the PLATO system — for example, student performance and keyset response queuing studies, studies exploring the use of auxiliary equipment (motion picture projectors, physiological measurement apparatus, motion picture cameras, etc.), and studies to determine the effectiveness of various teaching programs. The teaching research projects have included topics in engineering and mathematics, drill sequences for remedial arithmetic, work in the area of verbal learning and retention, clinical nursing instruction, on-line student-response analysis and editing, concept-formation studies, and group-interaction studies. Three university credit courses have used the system: Circuit Analysis for electrical engineering students, Computer Programing (Fortran) for business and commerce students, and Introduction to the Use of the Library. Additional courses are being designed.

The results of the teaching research have been very satisfactory and have illustrated in many ways the flexibility of the system. The teaching research is continuing to expand. In addition, new types of terminal equipment are under development, most important of which is a new graphical display, which exhibits memory as well and will cost much less than the present displays, thus greatly contributing to reduction of the cost of PLATO terminals. Data-rates on some programs indicate that present-day computers could handle 3,000 to 5,000 terminals. Since data-rates required to operate the new graphical display are low enough to allow data to be carried over telephone lines, the advent of inexpensive terminals should pave the way for the production of large-scale, highly flexible teaching systems for classrooms, dormitories, and homes.

Computer-Based Education Research Laboratory
University of Illinois, Urbana
Charles J. McIntyre

The Computer-Based Education Research Laboratory is engaged in development and research in four main areas: (a) Further development of the PLATO system so that this flexible and versatile system will be economical enough for mass educational use; (b) preparation of additional educational materials for use in teaching on the PLATO system, including extension of the work on teaching logics; (c) research in analysis of student performance data; and (d) experimentation in the use of the PLATO system as a vehicle for on-line research. The Laboratory was established in the Graduate College in October 1966 to reorganize and to expand the work in these areas.

A very promising device for the PLATO system is a new plasma display, developed in the PLATO group of the Coordinated Science Laboratory. This new display plus a new system design show promise of improved performance at much lower cost per student station.

Some courses have been taught on the PLATO system, and the development of new courses and teaching logics is based on these earlier experiences. Courses will be developed for elementary and secondary schools and for colleges and universities.

In addition to the teaching use of the system, the same set of hardware and, in some cases, much of the computer programs are of great potential value in research. Some research in psychology and in internation simulation is under way, and the research use of PLATO will be expanded to attempt to test the full capabilities of the present and future systems.

The organization of the Laboratory makes available a number of major efforts in the general area of mputer-based education to qualified individuals tside the University of Illinois.

mputer-Assisted Instruction
iversity of Texas, Austin
Victor Bunderson

The objectives of the University of Texas Com- ter-Assisted Instruction Laboratory are a reflection a major thrust of the University itself to achieve adership in the applications of computers to the oblems of a large university. The Laboratory was ganized under the Faculty Advisory Committee on omputers, with no formal ties with any single de- artment. The action-oriented, interdisciplinary spirit the administrative context within which the lab is t is reflected in its objectives: to explore and define e role of computer-assisted instruction (CAI) in a rge university and to develop this potential through terdisciplinary research and development projects imed toward early implementation.

This role in a large university is now seen to be in hree areas: *computer assistance to the student* as a esource (assigned or unassigned) for individual tudy; *assistance to the teacher* through providing him with up-to-date summaries of student progress, in- ividually and as a group; and *computer assistance o the researcher*, so that the results of basic and pplied research on learning and instruction may be ed back into program development.

Three broad classes of *assistance to the student* may be distinguished: *drill and practice*, *tutorial*, and *imulation* or *gaming*. A drill or practice program onsists of a list of parallel items presented with a airly standardized student-computer interaction for ach item, to build discrimination or vocabulary skills basic to some specified content area.

A tutorial program can be distinguished from drill programs both in diversity of teaching frames and student-computer interaction and in breadth of content. Its objective is usually to impart a definite amount of information and concepts and induce the student to use the concepts properly. The method employed is question-and-answer with extensive branching in order to adapt to students' individual differences.

Simulation or gaming emphasizes feedback to the student of the results of his decisions or actions on the simulated system. The student learns to modify his inputs to the system in order to achieve some objective. These programs often assume that the student already possesses whatever concepts and skills are necessary and must now use his knowledge in the complex simulated situation.

A fourth type of student-computer interaction, more a resource than a type of instructional program, is real-time computation, retrieval, and display. In this mode the student communicates through a simple algorithmic language such as JOSS, BASIC, or MAT, or a retrieval language referencing and information file, and uses the computer as a problem-solving and exploratory tool. The possibility of linking this mode intimately with a question-answer mode is exciting. Of these four learning modes, it seems clear that the last two most fully utilize the computer's unique capabilities.

The philosophy developing at the University of Texas is that the most promising contemporary application of computer-assisted instruction in the lecture type of course which now comprises the bulk of undergraduate education will not come through replacing lectures with long tutorial programs. Rather, it will be through computerized testing, grading, and reporting, which can provide both the student and the teacher with immediate feedback to guide their further efforts. Also, short tutorial or drill CAI programs may be used for remedial purposes at the instructor's discretion for those students falling below minimum entry requirements, or simulation programs used as enrichment or as laboratory experiences.

The Laboratory is developing instructional programs in each of the four modes described above. Scientific German will be primarily a drill-and-practice program, with practice on carefully selected lists of sentences to gain facility with German syntax and vocabulary.

The statistics project represents an attempt to produce a tutorial program for a fairly large and detailed content area. A number of difficulties have been encountered in this project. One is the difficulty of typing formulas with special symbols. The provision of a major effort on statistics seemingly must wait for more adequate equipment and software.

The chemistry lab exercises represent a class of programs which seem very promising applications of computer-assisted instruction. Each simulated laboratory exercise will take but a short time and hence will not tie up large blocks of terminal time for a single student. The exercise, or "activity package," can be used by an instructor in a variety of ways: as a laboratory adjunct, a homework assignment, or an examination. The instructor need not use the whole set — a dozen or so packages — in order to get at the few he really wants and needs. The recent surge of interest in single-concept films has shown the importance of giving the teacher flexibility in selecting his instructional aids in this manner.

In addition to the chemistry programs, two other simulation projects are under way. One is an in-basket program for graduate students in school administration. This program is very similar in structure to the Qualitative Analysis program. The student is presented with a situation calling for a decision. He requests information from the console until he is able to come to the conclusion judged by the author to be best in some sense.

The Empathy program presents simulated counseling and teaching situations to the student teacher or counselor and provides feedback regarding the probable effects of choosing various courses of action.

College instruction may be viewed as a guessing game, course objectives being unclear to the students and their attainment by students being unclear to the instructor. Two major problems are apparent: the college teacher must be trained in the methods of stating instructional objectives and assessing them, and the lag in attaining feedback from unit tests must be reduced for both teacher and student. Computer-assisted instruction can assist the teacher in the second of these problems.

A Coursewriter CAI system such as the 1440 system is well suited for administering multiple-choice or completion tests to a small class of students. Two modifications are necessary. First, the task of coding must be automated to the extent that the instructor can merely give a copy of his exam to a keypunch operator to be punched, then run through a program which produces scoring and feedback to the student after each item. The second problem is to provide programs which will process the student responses and point out item analyses and summaries for the instructor both in regards to individual students and group performance.

Any sound curriculum development project must have a strong applied research backup to evaluate its products. The computer's capabilities to control the presentation and sequencing of teaching frames and record student responses make the researcher's task much easier.

While the philosophy of the University is action oriented in terms of seeking an early impact on instructional practice, there is no intention to neglect a strong program of both basic and applied research. Indeed, the purchase of a CAI system by a university could be justified on this count alone.

The following research projects have been completed during 1966:

- Comparison of computer-assisted instruction and programed text in learning elementary statistics
- Effects of simulated chemistry lab activities on the attainment of freshman lab objectives
- Effects of a CAI program teaching number sequence heuristics on inductive reasoning ability
- Effects of intertrial interval length contingent on response correctness in solving concept problems
- Relationship of aptitude and personality variables to performance in a computerized instructional environment
- Teaching heuristic problem-solving methods by computer
- Conversational administration of the Sentence Completion Test by computer
- Automated test assembly, administration, and analysis as an adjunct to instruction in elementary statistics
- Teaching elementary music concepts by computer
- The effects of simulated management experience on information selection and decision style.

The Application of CAE and Multimedia Course Development

U.S. Naval Academy, Annapolis, Maryland

Paul L. Quinn and William M. Richardson

The Computing Center of the U.S. Naval Academy is currently (1967) involved in a project of educational research in computer-aided education and the application of educational technology to multimedia course development. The ultimate goal of this research project is to increase the quality and effectiveness of the learning process at the Naval Academy and other educational institutions by the application of the systems approach to education, which requires that all facets of the educational environment be studied with the ultimate goal of optimizing the complete system. The project consists of the following four segments: the preliminary investigation, the organizational phase, the experimental phase, and the operational phase.

The first step in applying educational technology to course development is to study, evaluate, and define the objectives of each particular course, as well as each segment of the course to which these principles are to be applied. For each course selected, entering behavior (prerequisites) and terminal behavior must be defined and stated in behavioral terms for each segment of the course.

The establishment of criteria for assigning available educational media to defined course content is the next critical step in the procedure. The staff of the Computing Center visualizes the crucial assignment of educational media to instructional material as a matching process: each segment of instructional material to be presented to a student is exposed to and evaluated against the different media available. The goal of such a procedure is to utilize the educational medium which best achieves the objective of that particular segment of instructional material, not *solely* to advance the use of computers in education. The procedure is intended to be learner oriented and not hardware oriented. The matching process would basically include the following educational media: programed instruction, audio presentation, educational television, computer-assisted instruction, film and slide presentations, standard text, lecture techniques, laboratory sessions, and other applicable media.

The preliminary investigation consisted mainly of a faculty summer study project concerned with the feasibility and application of time-sharing terminals in the educational process at the Naval Academy. Fifteen faculty members representing various academic departments participated in this 10-week training course which involved experts in educational applications of time sharing. They became familiar with the General Electric Basic Time-Sharing System and prepared sample course material to be presented in the fall semester of 1966. At present there are nine time-sharing teletype terminals connected to commercial computers in the various academic disciplines across the Academy grounds. These terminals are being used on a limited basis for both laboratory and cture sessions, and their potential use as an educaonal tool is currently under test and evaluation.

The organizational phase began following the sucssful conclusion of the summer study. The main bjectives of this phase were to establish the working rganization, train personnel, select the experimental ystem, and design and provide adequate facilities for e project.

A faculty orientation in educational technology was onducted; 20 faculty members attended the 10-week 2 hours per day) course in order to prepare themelves for constructing courses using newly emerging ducational technology. During the course faculty embers were exposed to the problems involved in riting objectives in behavioral terms and were given xperience in programing objectives they have ritten for courses they presently teach. The diferent modes of educational technology and their pplication to instructional material were discussed. xperience in educational computer systems was inluded. This group forms the hard-core faculty group hat initiated the experimental system and will lead in he training of additional faculty members.

In January 1967 the Computing Center of the U.S. Naval Academy received an early nonproduction model of the IBM 1500 instructional computer sysem and began the experimental phase of the project. The 1500 system is provided by IBM in a mutual participative agreement in educational research. The Academy will utilize this system as one type of educational medium in the master plan of multimedia course development.

The 1500 system is capable of servicing 32 timesharing student terminals. Each individual student terminal includes a cathode ray tube (CRT), a typewriter, an audio presentation, and an image projector. In addition to this, each student terminal is provided with a closed-circuit TV receiver.

National Education Association photo

Following considerable experimentation with full-scale 1500 terminal components the initial design of the individual student terminal stations has been completed. Each student sits in an enclosure, the back and both sides of which are of soundproof construction. On the built-in desk immediately in front of the student are located the CRT unit and typewriter in addition to suitable desk-top working area. The image projector and TV receiver are mounted on shelves at eye level above and somewhat behind the components on the desk top.

The student terminal stations are located in a U-shaped configuration around three sides of the classroom, so that when a student is using the computer his back is toward the center of the room. Directly in front of the student stations is a continuous row of tables, also in a U-shaped configuration. A student can turn 180 degrees and be seated at a table looking toward the open end of the classroom when not working on the computer, to be ready for other types of presentation. He has ample room to work through normal text, a programed-instruction text, see a slide or movie presentation, and participate in a lecture or recitation. At the front of the experimental classroom are the proctor's desk and station where he has available a typewriter input to the 1500 system. It is planned to experiment with arrangements in an effort to determine the optimal configuration and appearance that such a classroom might take on in the future.

The major effort put forth in the experimental phase will be in four course areas while other course modules will be prepared in a broad front approach. These courses will undergo extensive test and evaluation on a limited number of sections of midshipmen during the experimental phase.

Specifications for a larger time-sharing computer system to be employed during the operational phase are currently being developed. While the objectives of the experimental phase are to prepare, program, conduct, evaluate, and modify the courses selected for multimedia course development, the objectives of the operational phase will be to measure the effectiveness of multimedia courses and revise as necessary. Cost analysis of the development of the various courses will be considered as part of the criteria considered for future expansion of the program. Important decisions will be made during this period which will shape the development of education at the Naval Academy in future years.

INSTITUTIONAL INVENTORY

Arkansas State College, State College. Library use of punched cards to automate circulation control employs master book, return, and charge cards. (Charles Younger)

Augustana College, Sioux Falls, S. Dak. Students learn to use computers in experiments in science and social science classes, have access to the computer at any time. (Robert B. Binger and Tom Kilian)

Bemidji State College, Bemidji, Minn. Limited remote use of computer via teletype — mostly to teach data processing. (Alden Lorents)

Bowdoin College, Brunswick, Maine. Students may use computer in independent study and as regular parts of undergraduate research projects. (James A. Storer)

Bridgewater College, Bridgewater, Va. After 1967 installation, various computer applications to be made throughout the College. (John E. White)

Carleton College, Northfield, Minn. Uses of computers in experiments in science and social science. (W. D. Weatherford)

Centre College of Kentucky, Danville. Programed courses in chemistry-physics (combined) and in German are being developed, with remote connection to a computer in Tallahassee. (John W. Frazer)

The Citadel, Charleston, S.C. Computer used by students in political science for opinion analysis. (Earl O. Kline)

Clarke College, Dubuque, Iowa. Computer used by students in mathematics and other classes to solve problems. Operators are being trained in other classes. (Sister Mary Kenneth Keller)

Colorado College, Colorado Springs. Computerized programing devices used in 4 laboratories in psychology to set and record stimulus-response tasks. (John Shearer)

Cooke County Junior College, Gainesville, Tex. Course in programing uses Fortran IV, de-emphasizing mathematics. (Charles Smith)

DePauw University, Greencastle, Ind. Computer used for instruction in principles of computer work and for individual research. (Robert H. Farber)

Eastern New Mexico University, Portales. Automated Learning Center uses IBM 1401-1620-1130 with IBM 360 on order, for program research design, production, and eventually CAI. (Herbert E. Humbert)

Fairmont State College, Fairmont, W. Va. Faculty is being trained in computer use; campus consultant in CAI employed; on-line terminal to remote computer center (at West Virginia University) to be provided. (Billy G. Dunn)

Florida State University, Tallahassee. Computer-Assisted Instruction Center established in Institute of Human Learning. (R. P. Kropp, H. W. Stoker, and D. L. Hartford)

Iowa State University, Ames. Selective Dissemination of Scientific Information study uses IBM 360/50. Indications are: (a) an adequate number and scope of input documents is needed; (b) the individual user profile must be extensive and takes considerable time to develop the list of pertinent words; (c) a user is usually satisfied by receiving 35-40 notifications a week and will use 10-15 documents from the list. (George C. Christensen)

Johns Hopkins University, Baltimore, Md. Computer programing taught. (C. P. Swanson)

Junior College District of St. Louis — St. Louis County, St. Louis, Mo. Describes cooperation with a commercial book-processing company in producing printed and bound computer catalogs in quantity. Experimental use of computers in instruction in preparation for permanent campus installation. (David Underwood)

King's College, Wilkes-Barre, Pa. Experimenting with a technique of grading chemistry essay examinations by means of key words assigned numerical values and totaled for each student by computer. (Jay A. Young)

Los Angeles Valley College, Van Nuys, Calif. Computer use taught in mathematics department. (Kermit Dale)

Meramec Community College, Junior College District of St. Louis — St. Louis County, St. Louis, Mo. Computer terminal is connected by telephone line to an IBM 360-75 computer system at McDonnell Automation Center in St. Louis County, Mo. (Walter E. Hunter)

Midwestern University, Wichita Falls, Tex. Instruction, examination, and research utilization of computer system. (C. T. Eskew)

New York University, New York, N.Y. Computer instruction and free use of computer facility provided to students and faculty for research and problem solving. (J. Heller)

Pennsylvania State University, University Park. CAI used for record and development activity, applying computer techniques to instruction. Item analysis and analyses of student performance on tests developed for instructors. (Harold E. Mitzel and Leslie P. Greenhill)

Polytechnic Institute of Brooklyn, New York, N.Y. Use of IBM 7040 computer to drive Stromberg-Carlson 4020 cathode ray tube recorder to produce 16mm and 35mm computer-animated films. Since 4020 operates from magnetic tape which can be generated, in turn, on almost any digital computer, computation also can be done outside of educational and developmental facility at the institution, and tape then mailed for processing into films. (L. Braun)

Purdue University, Lafayette, Ind. Programs in languages, psychology, engineering, and computer use are being prepared. (J. Christopher Reid)

St. Cloud State College, St. Cloud, Minn. IBM 1620 and 1401 used in teaching programing, and in research and administration. CAI being planned. (Luther Brown)

Santa Barbara City College, Santa Barbara, Calif. Programing taught by teletype provides immediate feedback to learner on program errors. (Eugene D. Gingerich)

Stanford University, Stanford, Calif. Elementary school CAI in mathematics displays (random-access) microfilm on 10" x 13" screen, with light pen responses; also uses cathode ray tube for graphs and taped information and responses. Computer is PDP-I; in school setup, IBM 1500 instructional system is operated by IBM 1800 computer. Coursewriter II programing language. (Patrick Suppes)

State University of New York (SUNY) at Buffalo. Has programed some "computer-assisted instructor" units for grades 3 and 11: sets forth activities for each student based on information about him and about objectives. Also used computer in distributing AV materials. (Taher A. Razik)

SUNY at Stony Brook. Eight IBM 1050 terminals connected to remote IBM 7010 computer; 32 student stations with typewriter and cathode ray tube terminals are planned; 5 CAI courses are being tested. (E. D. Lambe and Richard F. Hartzell)

SUNY, College at Geneseo. Now in process of planning a computer center; director and space identified but equipment not yet installed. (Clarence O. Bergeson)

SUNY, College at Potsdam. One full course taught by CAI and several units in other courses on experimental bases. (Robert C. Henderhan)

Sul Ross State College, Alpine, Tex. Research Center of West Texas Innovative Education Center will have as its purposes to — (a) compile, provide, and disseminate information from any educational source; (b) participate in research in connection with public and private schools and institutions of higher learning; and (c) work with the Regional Research Center. Will use a retrieval teletype (TWX) system for two-way communication, and recommends a computer to collect and catalog information for educational uses. (Bob W. Miller)

Texas Educational Microwave Project, Austin. The 1966 Texas Educational Microwave Communications Network Study is a study of the potential of the present project for transmission of computer-based information; also, investigation of implementation of remote CAI information retrieval, and sharing of computers already installed. (Hugh Greene)

University of California at Irvine. Computer facility at present has available an IBM system similar to one in use at IBM Watson Research Laboratory and is provided to the University by IBM under an ongoing research agreement. (Bill Stead)

University of California at Santa Barbara. On-line computer communication system remotely accessible to several campus departments. (A. Dale Tomlinson)

University of Connecticut, Storrs. Computer programing courses in engineering. Training 10 Ph.D. candidates in using computer techniques in academic areas. Participation in MEDLARS (Medical Literature Analysis and Retrieval System). (Donald W. Friedman)

University Council for Educational Administration, Educational Testing Service, Princeton, N.J. Developing a computer-based system for research and instruction in administrative decision making. Objectives are to (a) elicit individual, observable behavior indicative of covert cognitive information processes activated by postulated administrative decision making; (b) elicit responses to problem situations in a manner so uniform as to allow the responses to be comparable from one administrator to the next; and (c) elicit behavior in a setting similar to real world decision-making situations so as to stimulate new insights and theoretical formulations which can be tested against on-the-job administrative processes. Facility must be capable of enabling a subject to communicate with the computer, provide feedback to the subject, and store and analyze personal and behavioral data. (Robert Ruderman)

University of Florida, Gainesville. IBM 360 to be installed at University in 1967; terminals in the laboratory school; will permit experimentation in scheduling, finance, curriculum supplementation, CAI, and other phases of secondary school work. (K. A. Christiansen)

University of Illinois, Urbana. Further development of PLATO: additional software for PLATO; research in analysis of student performance; experimental use of PLATO for on-line research. (Charles J. McIntyre and Elisabeth R. Lyman)

University of Pennsylvania, Philadelphia. EDEX or similar student response unit used in TV laboratory, giving a "hard copy print-out" identifying students who failed to understand; followed up by individually prescribed instruction (Hugh M. Shafer)

University of Texas, Austin. Uses components of an IBM 1401-1026 for interdisciplinary programs to explore and define the role of CAI in a large university and to develop this potential through interdisciplinary research and development projects aimed toward early implementation. Has defined three broad areas of use: (a) computer assistance to the student as a resource for individual study; (b) assistance to the teacher by providing him with up-to-date summaries of student progress; and (c) assistance to the researcher so that results of basic and applied research on learning and instruction may be fed back into program development. (C. Victor Bunderson)

University of Wisconsin, Madison. Teaching Information Processing System (TIPS) analyzes student performance on quizzes and enables instructor to assign special individualized study. (Allen C. Kelley, Barbara W. Newell, and Donald K. Stewart)

U.S. Military Academy, West Point, N.Y. Extensive "open-shop" utilization of computers by cadets so that every cadet may become qualified in computer operation. (William F. Luebbert)

U.S. Naval Academy, Annapolis, Md. Inauguration of CAI stresses development of faculty interest and ability through workshops. (Paul L. Quinn and William M. Richardson)

Wisconsin State University at Oshkosh. Plans for physical facilities are being finalized for the computer center which is to serve Oshkosh campus and the Fond du Lac branch campus. (Frederick J. C. Mundt)

SUMMARY

At the beginning of 1967, after only a very few years of experimentation with the medium, several tentative observations about the potential of true computer-assisted instruction seem to be justified:

1. It is now possible to present either complete courses or supplementary exercises to college students by means of computer dialogue. Such course material can be made available a considerable distance from the controlling central computer.

2. The records that computers can provide about the successes and difficulties of each student working through a course will be of crucial importance in improving course materials, no matter in what mode the course will later be presented.

3. Only a very few complete instructional programs for computers have been developed. Before computer-assisted instruction can be made available to large numbers of students and in most disciplines, a great deal of developmental work is needed.

4. The installation of computer-assisted instruction terminals at present is very costly, although expansion of the number of courses and of student terminals, as well as increased experience, will surely reduce the cost. Further experimentation is generally recommended, both because of the light this kind of research can throw on the nature of learning, and in order to determine whether the advantages of computer-assisted instruction balance its economic costs.

5. The available computer hardware is capable of caring for the instructional calls of 1,000 or more students in several disciplines at one time, without significant delay for any student. The present lack is in variety of software (programs) and in student consoles.

6. An outstanding advantage of computer-assisted instruction is the provision of detailed records of the progress of individual students, so that the program itself can be constantly improved and revised, examinations can be improved, and individually prescribed exercises can assist each student to learn at his own best rate.

7. Perfection of a fully flexible program of instruction along the lines under investigation at the University of Illinois and the Pennsylvania State University would free instructors for much more individual and small-group instruction, and so would increase the effective amount of instruction available to each student.

8. The promise of the technique has been sufficiently demonstrated that continued experimentation in additional institutions should be encouraged. The HEMS staff realize that the present cost and complexity of equipment are discouraging aspects of the medium. It is probable, however, that additional experience will reduce both cost and complexity to the point at which computer-assisted instruction might become the most economical and effective type of programed instruction. Continued experimentation to discover the limits of this potential appears to be justified.

IX

SPECIAL MULTIMEDIA FACILITIES

THE several special types of multimedia facilities that have been developed in institutions of higher learning across the country represent efforts to solve certain common problems associated with instructional uses of new media. The facilities include, among others, the generously equipped single classroom, the auditorium designed to accommodate large-group presentations backed with appropriate audiovisual elements, and the increasingly popular classroom building containing several multimedia classrooms that are served by central new media facilities (usually in its core).

When auditoriums or large lecture rooms are used to accommodate large numbers of students, such as those in introductory classes, it is often difficult or impossible for all of those students to profit from visual materials or demonstrations. If equipment and projectuals must be procured and transported to the classroom each time they are used, instructors may become discouraged in their attempts to improve their instruction by these means. All too frequently they retreat to conventional lectures unadorned by visuals. The difficulty is compounded, of course, for the more daring instructor who attempts to introduce several different media — slides, films, opaque projections, or audiotapes, for example — into his presentations.

The multimedia classroom or building facility is an attempt to obviate some of these difficulties and at the same time to improve quality of instruction by making it convenient and attractive to both instructor and students to use several avenues of learning in a single class period. Typically, a multimedia installation will combine in a hexagonal or octagonal building a series of triangular rooms of comparatively large capacity (75 to 300 students), surrounding a projection core in which equipment is provided for projection of films, slides, videotapes, and off-the-air or closed-circuit television onto a transparent screen of large size at the front of each room. In some installations, the large screen is replaced by TV monitors within easy viewing distance of each seat, and a camera is available so that demonstrations at the teacher's rostrum may be magnified for better viewing. Tape recorders are available also, either to record the lecture as it is delivered in the classroom or for playing of prerecorded material. Typically, too, the projection may be controlled either by the instructor (from the rostrum) or from the projection core (by a technician). In a few installations, a carefully preplanned presentation can be programed on punched tape and controlled "out front" by the instructor by means of a single switch. A further refinement of this practice allows the entire presentation to be prerecorded on tape, with subaudible electronic cues to activate the visuals.

Several such installations provide for student responses to multiple-choice questions by means of buttons at each seat. These responses can be summarized visually on dials at the rostrum that permit the instructor to see whether a majority of the class have mastered the concept, or on dials visible to the entire class. This same response system, if desired, also can be connected to a computer so that total responses of each student to any series of test questions, as well as an item analysis of the questions themselves, may be provided to the instructor at the end of the class period.

A variation in multimedia techniques is represented by facilities designed especially to carry out the program of a single department, and assigned completely to it. Thus, in two instances observed in this study and reported here, psychology departments have developed elaborately wired learning research laboratories that permit experimental tasks to be presented to humans or animals in one space while the performance is viewed in a classroom; or the classroom itself may house the experimental group, while data are collected electronically in a remote-control room and analyzed instantaneously for each subject as well as for each task.

CASE DESCRIPTIONS

Automation-Telemation-Responder Laboratory

Illinois Teachers College, Chicago North
Charles H. Stamps

Illinois Teachers College, Chicago North, contains one main air-conditioned auditorium seating 670 students in an arena-type theater with gradually sloping aisles. Located at its front are two screens that comprise the facade of the teleprompter multiscreen system (Telemation). This audiovisual device may be completely automated for the presentation of instructional materials.

Students attending classes in the Telemation Auditorium focus their attention on two large screens on which is projected a sequence of images visually representing the progress of the professor's lecture. These images, the professor's lecture, and, if desired, motion pictures, television, and recorded music or voice can be coordinated to make an integrated impact on the student's mind through his senses of sight and hearing.

A battery of projection equipment functions behind the screens. Behind the south screen there are a 16mm motion picture projector, a large screen TV projector, and a 3¼" x 4" slide projector. Behind the north screen are another 3¼" x 4" slide projector and two 2" x 2" slide projectors.

The large projectors are the Telepro 6000. The small projectors are Spindler and Sauppe and can be used with either 2" x 2" or 35mm slides in 48-slide capacity rotary magazines; they can be operated in both forward and reverse directions. The movie projector can be controlled by the lecturer, thus providing for integration of films into the lecture as desired. The TV projector is the teleprompter large screen model and is capable of projecting broadcast television from any VHF station, closed-circuit hookup, or videotape recorder.

In addition, the area houses a control console, two tape recorders, a sound system, and the electronic system which controls the complete installation. This placement of equipment eliminates the noise and distraction that often accompany more conventional applications of audiovisual equipment. A duplicate control console in the lectern on stage permits control by either the on-stage user or the backstage control staff.

The control system of Telemation provides four different modes of operation:

Photo by Charles H. Stamp

This control console operates the teleprompter unit that sequences multimedia presentations for large-group instruction at Illinois Teachers College, Chicago North.

1. *Independent.* In this mode the lecturer controls each piece of equipment from the lectern. Each projector can be operated independently of the others without necessitating any formal prearranged program.

All other modes of operation require the presentation to be programed on a set of punched cue cards. During the progress of the lecture, these cards feed through a card reading device that activates the appropriate output channel. The system has a capacity of 12 channels, that is, it can control up to 12 pieces of equipment during the course of a single presentation.

2. *Manual.* In this mode the lecturer uses only one control button on the lectern to advance the cue cards and operate the equipment. He may use the usual script or outline, or read his lecture from typed video-scripts mounted on the teleprompters.

3. *Semiautomatic.* In this mode the lecturer uses no control buttons. The complete lecture is prepared in advance and typed on three video-scripts. One of these is cued with metallic strips and mounted on the control unit backstage. The other two are mounted on two teleprompter readers on either side of the lectern. The three scripts are advanced in synchronization, and the script in the control unit activates all

he audiovisual effects through the card reader. The monitoring technician paces the script to suit the ndividual lecturer. The lecturer may digress or ad-lib, but the system will be cued only when the preplanned cue words pass the detection devices.

4. *Automatic*. In this mode the lecture is recorded on audiotape. The second track of the same tape holds a subaudible cue which activates the projection equipment through the card reader. When the tape is played, the voice is fed through the auditorium sound system, and the projectors are automatically controlled and advanced at the proper time by the cues on the tape. No participation on the part of the instructor is necessary during the course of this programed presentation.

Five hundred of the 670 seats in the auditorium are also equipped with individual responder units set directly into the arm of each seat. Buttons are marked A, B, C, D, E, and OFF. During the course of a presentation a question or opinion may be asked of those in the auditorium. Responses are recorded by pushing the button corresponding to the code given in the instructions. Each responder station is wired to a master switching panel where monitoring can be initiated. Two methods of such monitoring are desirable:

1. Immediate analog scanning of all responder units and feedback to the lecturer of the percentage of students answering each alternative.
2. Complete digital monitoring of all responder units by a computer which can accumulate and store responses and prepare the following kinds of reports at the end of the lecture: (a) item counts and item analyses of all responses to each question; (b) total correct responses for each student; and (c) statistical calculations, graphs, and other pertinent information that may be used to improve subsequent lectures.

The first monitoring system is already in operation. Connected to the master switching panel is a device that can scan and record the percentage configuration for all the responder units in the auditorium. The display unit is mounted at the lectern, and the lecturer can immediately tell how many students are responding to his question and the percentage responses to each alternative. The second system was planned for in the installation of the master switching panel and will involve the participation of the Data Processing-Computer Center of the school.

Multimedia Units at Indiana State University

Terre Haute

Russell McDougal

Planning for a new classroom building at Indiana State University began in 1963. Visits were made to institutions such as Miami University, Illinois Teachers College, Western Michigan University, Syracuse University, and Purdue University. Considerable consultation was done with an architectural firm and with the president and dean of the University. Eventual planning for the building included a 50-place language laboratory and two rear screen projection rooms, each seating 255 students and having a projection room immediately behind the screens. It was decided early in the planning that teleprompter automation would be installed in these rooms if possible.

The rooms were planned so that 250 people could at one time listen to a lecture illustrated on the screen by such media as 2″ x 2″ slides, 3¼″ x 4″ slides, projection television, or with the use of tape recordings or overhead projection. Conduits in the floor of the auditorium permit future installation of a student response system. Eventually these student responses may be wired to a computer to provide quick knowledge of test results.

One problem of this type of instruction is the education of professors in the use of new media. Surprisingly, many of them seemed quite sophisticated in their knowledge of the use of new media, and nearly all of the others were eager to learn. Motion pictures and 2″ x 2″ slides are the most popular devices used, and it was soon discovered that front screen overhead projection was also necessary. A tilted overhead projection screen is kept near one side of the front of the auditorium for overhead projection. The professors use this overhead projection as a blackboard when talking to their classes. One of the two rooms has a rear view screen of glass and the other has a rear view screen of plastic. Each of the rooms has a thick glass between the projection room and the auditorium so that sounds do not carry through to the audience.

Automatic teleprompter equipment is installed in one of the rooms, and manually controlled switches are installed in the lectern in the other room. Each of the rooms has a regular teleprompter lectern with a clock, a light, microphones, etc. Each of the rooms permits use of a lavaliere mike. The projection room provides FM-AM radio, connections for closed-circuit and open-circuit television, monitor speakers, intercom telephone, and four tape recorders. Both fluorescent and incandescent panels are installed in the classrooms. During a showing of pictures in the teleprompter room the lights are dimmed automatically so that the students may see to take notes but be able to see the picture on the screen clearly. In the auditorium which does not have the teleprompter the lights may be dimmed by a switch on the lectern.

A Study Skills Center

Los Angeles Valley College, Van Nuys, California

M. Jack Fujimoto

Los Angeles Valley College is a 2-year community college offering a transfer program to the 4-year college and a terminal program leading to the associate in arts degree. Its Study Skills Center was opened in September 1962 in response to a recognized need for supplementary aids to students who were having difficulties in academic subject areas.

At present, the Study Skills Center is housed in a three-room temporary bungalow and is staffed by a coordinator, volunteers from the College's instructional staff, and student workers. The bungalow currently houses more than 100 subject titles of programed instructional text materials, teaching machines, and self-tutoring aids. As new programs have been developed they have been acquired through recommendations from the instructional staff.

"There are no grades.
"There are no credits.
"Attendance is voluntary."

The above statements, printed on the brochure describing the self-help facilities available to students, account in part for the continued growth and popularity of the Center.

Attendance since 1962 is documented by the following statistics:

1962-63	370 students
1963-64	420 students
1964-65	700 students
1965-66	1,200 students
1966-67	1,800 students

Based on a reasonable growth of the student population (17,000 in 1966), our current projections indicate that the Study Skills Center must provide a study aid for 3,900 to 4,500 students by 1970. Due to the projected growth and continuous use of the presently crowded facilities, the Center is being transferred to new quarters in the library complex where student aids will be available at a centralized location. The student seeking research data will have ready access to the library resources. The student seeking study skills aid will be able to use the supplementary resources of the Study Skills Center. On completion of the addition (spring 1967), the audiovisual materials also will be housed in this library complex.

At present the Center maintains the following machines for student use: Autotutor Mark II, Minimax, Mast Teaching Machine, Craig Reader, Tape Recorder, and Reading Pacer. There are several machines of each type available. Students use the teaching machines on a first-come, first-use basis. Student reaction to the use of teaching machines has been quite favorable.

The Center also has many programed textbooks for supplementary classroom use in varied subject areas. English, mathematics, and the physical sciences are the subjects where aids to promoting improvement in skills seem to be most readily available.

The students who have visited the Center show a considerable degree of enthusiasm when using the supplementary materials available for their study courses.

The Center has been branching into adjunct areas of student aid in addition to programed instruction and tutoring machines. In cooperation with the English Department, a Writing Laboratory has been organized and has been operating successfully for the past year. Students are tutored by outstanding English students under faculty supervision. Organizing ideas for writing of themes is stressed. Vocabulary building, spelling, punctuation, and structural grammar are supplementary aids provided by materials available in the Study Skills Center.

With the assistance of the counseling staff of the College, study skills seminars have been held. In those group sessions students learn to make their own schedules, budget study time, and in general find assistance in orienting themselves to college academic life. Counselors and faculty members representing various subject disciplines are available for consultation when needed.

During the spring of 1967, a Listening Center with 140 listening posts was opened for student use. Many campus departments are now engaged in preparing tapes of lectures, musical productions, dramatic skits, speeches, business transcriptions, and numerous other new materials and tutoring devices. It seems reasonable to predict that the Listening Center will also become another important source of supplementary learning for students seeking assistance.

The Professor's Multimedia Instruction Desk

Oral Roberts University, Tulsa, Oklahoma
Paul I. McClendon

Each classroom in the Learning Resources Center at Oral Roberts University is equipped with a multimedia instruction desk which integrates in one unit a variety of permanently built-in features. On one side

Large-group instruction is carried on increasingly in specially equipped auditoriums such as this one at Oral Roberts University. The panel in front of the instructor provides fingertip controls for a variety of audiovisual presentation devices — motion picture projectors, slide and large transparency projectors, tape recorders, and disk recording playbacks.

of the top surface is affixed a flatbed Model 88 3M transparency projector. The projector is tilted slightly to project without keystoning onto one half of the surface of a projection screen mounted overhead. The projector has a fixed focal length with respect to the screen. In the center of the instruction desk is a hinged self-storing lectern. With the lectern in the stored position, the desk top is flat. On the other side, two hinged doors in the desk top open to a compartment containing a Kodak Carousel 35mm slide projector and a Wollensak T-1500 audiotape recorder. The slide projector also has a fixed focal length relationship to the overhead screen and uses the other half of the projection screen surface. It has a separate off-on switch and uses a remote control switch for forward, reverse, and focus functions. The audiotape recorder microphone is equipped to plug in to the lectern for use when the professor is standing or in to the opened surface of one of the compartment doors for use when the professor is seated. The compartment door receptacle also serves as the storage retainer for the microphone when the compartment is locked.

The projection screen is made from a mat-finished, specially prepared ¾" plywood mounted in such a fashion that the entire screen appears to be floating. An auxiliary classroom light switch is located immediately adjacent to the multimedia desk so that classroom lights may be turned off when necessary.

Chalkboards are metal in order to accommodate magnetic display materials. Hook-and-loop boards provide additional display surface.

The entire optical display arrangement along with the remote-access video display and audio system in each classroom allow the professor to make a smooth transition in use of media at any time without moving any screens, or walking across the classroom to a light switch, or adjusting window shades. Classrooms are carpeted, windowless, and air-conditioned in order to provide uniform environmental conditions most conducive to efficient study.

A fully equipped Instructional Materials Center prepares thousands of slides, transparencies, magnetic and hook-and-loop backed posters, charts, devices, as well as models and other materials upon request. Faculty are not limited in their use of these services, and all materials are charged against the Learning Resources Division budget rather than against academic departments.

The Forum Building
Pennsylvania State University, University Park
Leslie P. Greenhill

A new instructional building called the Forum was completed and put into use at Pennsylvania State University in 1965. In designing this building, which consists of four lecture halls each accommodating 396 students, special attention was given to characteristics believed to relate to effective teaching and learning of large groups of students.

The building is circular in shape and has a central core which contains equipment for projecting 2" x 2" and 3¼" x 4" slides, 16mm films, and television. The building is arranged to provide for rear projection on translucent screens in each of the four auditoriums. Each screen will accommodate two images side by side or a central image. Facilities also exist for audiotape recording and playback. A small TV camera is provided for each auditorium to be used for the magnification of small objects and demonstrations. The image from this camera appears via the TV projector on the large translucent screen. In each auditorium there is also provision for front projection on the overhead projector. All of the projection equipment in the central core may be operated by the instructor from his lectern or may be controlled by a technician in the central core.

Special attention was paid to characteristics of auditoriums which make for good visibility of chalkboards, projection screens, and demonstrations. The seating is in semicircular rows; the room lighting can be varied for different kinds of learning situations.

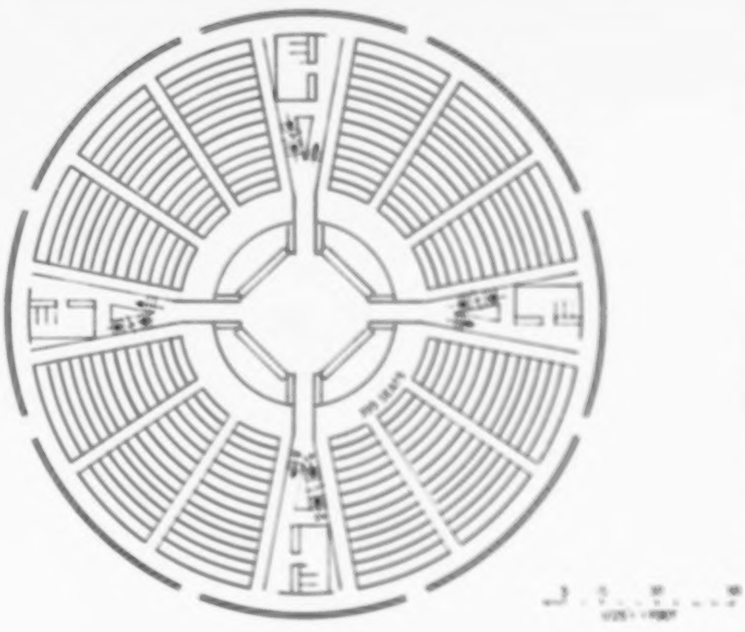
Special attention was paid to the acoustical characteristics of the room to ensure good audibility of the spoken word and projected sound. The building is air-conditioned. Provision was made in the original design for the subsequent installation of audience response equipment.

Still Photo Services

A view of a typical classroom in the Forum Building at the Pennsylvania State University.

Still Photo Services

The Instructional Auditorium Building of the Pennsylvania State University contains four large-group presentation classrooms, each seating 305 students. Pie-shaped, these classrooms provide excellent facilities for various types of visual and audio communication.



FLOOR PLAN
INSTRUCTIONAL AUDITORIUM BUILDING
THE PENNSYLVANIA STATE UNIVERSITY

Still Photo Services

This board, located on the instructor's podium, provides controls for all audio-visual presentation devices.

Multimedia Teaching Facilities

Rensselaer Polytechnic Institute, Troy, New York

William L. Millard

Since 1960 Rensselaer Polytechnic Institute has been engaged in a number of experimental instructional programs designed to exploit multimedia approaches in large-group teaching. The intent is to provide for concurrent displays of various combinations of visual and audio materials operated under direct control of the classroom instructor.

There are now six fully equipped multimedia classrooms and auditoriums in operation with a total seating capacity of more than 1,200 students. Six additional classrooms also were in various stages of completion during 1967.

Typically, each multimedia instructional facility contains —

1. A multiple-image front or rear projection system for the display of television, films, and slides remotely controlled from a lectern switching console.
2. Either a single or double overhead projection system.
3. A three-level lighting system interconnected with the switching console to set room lighting automatically at a level appropriate to the projection device employed.
4. An integrated audio system connected with the lectern console so that audio sources are automatically coordinated with the appropriate presentation.
5. An overhead TV camera system built into the lecture area and operated by the instructor.

Selected instructional spaces are interconnected with the campus TV audio, intercommunication, and control circuit distribution system.

Biology, psychology, economics, history, physics, engineering graphics, and chemistry are representative courses currently utilizing the multimedia approach to instruction on the campus.

In engineering graphics, for example, the instructor gives a live presentation from a small studio to students viewing in two interconnected multimedia classrooms. Slides and films are projected in each classroom as an integrated concurrent part of the overall lesson presentation. Similarly, 550 students are taught freshman chemistry in a converted high school auditorium by means of a multimedia system designed to take maximum advantage of both television and direct projection.

The auditorium is equipped with 15 TV sets; an overhead instructor-operated TV camera for display of written material, transparencies, book illustrations, small objects, and the like; two floor cameras for pickup of demonstrations and chalkboard work; a videotape recorder; and a control console.

In addition to the TV systems a direct projection system is provided for the display of slides, films, and overhead projector demonstrations on a rear projection screen. All projectors are controlled by the instructor.

The instructor has a complete range of teaching techniques, visual and audio aids, and communication systems to carry out his teaching program. A typical lecture may include use of the overhead TV camera system, live televised demonstrations, videotape presentations, a film clip, some slides, and perhaps some conventional chalkboard work. Effective use of these group communication resources demands advance organization and preparation and testing of segments of each presentation. In general, the flexibility of visual and audio display resources in these multimedia classrooms and auditoriums has given creative teachers new dimensions in communicating with students.

Feedback in Learning Systems

University of California at San Diego, School of Medicine

Charles F. Bridgman

If we envision Mark Hopkins instructing students in a log hut on a simple bench, most of us agree that learning is best accomplished in small-group tutorials. But even in such simple environments, there is a high level of sensory input to the learner through verbal and nonverbal channels adding up to effective feedback loops between student and instructor.

Toward this end, instructional facilities at the University of California at San Diego, School of Medicine, have been designed to encourage the development of several kinds of student response systems within learning areas. With the ever-mounting number of students, the intent is to use machines to humanize, not dehumanize, learning. For example, an electronic response system used during lectures allows students to transmit anonymously their answers to multiple-choice questions inserted at frequent intervals within lecture content, thus promoting an immediate collective feedback to the instructor as to their understanding. Such participation approximates a kind of tutorial teaching which results in early reinforcement of learning. This vital feedback information, instantly available to the instructor, allows him to branch or back up in his presentation as the need becomes evident.

At the same time, each student is aware of his individual performance as the instructor relates to the group an explanation of each correct response. Students, therefore, may judge their own performance in relation to that of their peers — much as examination grades traditionally offer some measure of performance feedback but, unfortunately, delayed beyond usefulness in learning. In essence, programed learning principles are utilized even within large groups.

Another setting, devoted to small-group instruction using programing techniques, includes specially structured exhibits which can be readily changed in accordance with subject emphasis and can be displayed in hallways. In this instance, the hallways become valuable instructional areas. Programed questions which illustrate or reinforce major concepts currently being studied in the laboratory are brought to the attention of students. Guided by these questions, students cluster into their own small-group tutorials characterized by spirited interaction and are only occasionally assisted by teaching staff.

Hallway exhibits, along with a multitude of other instructional materials, will originate from a Learning Resources Center strategically located near lecture halls and teaching laboratories. Production of these materials will take place in centralized facilities devoted to preparation of illustrations, models, plastic-embedded specimens, exhibits, still photographs, motion pictures, and videotape recordings. These facilities are conveniently located immediately below the Biomedical Library.

Multidiscipline teaching labs, designed as lecture laboratories, will be linked together by a video system that can be used to disseminate lecture content and pace laboratory exercises. Each student is assigned an individual cubicle and shares an adjacent laboratory bench with three other students. Sixteen students in all are accommodated in each laboratory, presided over by a teaching assistant. Six laboratory groups, holding in total 96 students (one medical school class), respond to live demonstrations over the video system. (One important premise is that students are enabled to apply immediately in the laboratory the information which they have just received in lecture form, rather than disrupt the continuity by moving from lecture halls to laboratories.)

Short video presentations alternate with more lengthy student participation periods for accomplishing their laboratory exercises. Questions from students are filtered and fed back to the lecture demonstrator by the teaching assistants located in each laboratory. The most important questions are discussed in succeeding demonstrations over the video system, again introducing critical feedback between lecturer and student. Videotapes of these demonstrations are then available during unstructured hours of the same day and for several succeeding days of that week. Such tapes will be held over in the Learning Resources Center until the following year when demonstrations are to be repeated for a new class. Last year's tapes act as instructional guides for the staff to improve each year's newly modified demonstrations.

The above applications of instructional media suggest some primary goals of establishing feedback loops within the learning experience. The major concern is in utilizing communication media to focus message stimuli in such a way as to sustain an arousal threshold which will give powerful impact to learning. However, it should be emphasized that the selection of the appropriate medium will be determined by the nature of the message being conveyed and the skills plus enthusiasm of the instructional staff in order to reach into the student where he is most receptive to learning.

Multimedia Visuals in College History
Wisconsin State University at Stevens Point
Frederick A. Kremple

Few attempts have been made to explore potentials of new visual media as instructional aids in the teaching of history on the college level. The major purpose of the research reported here was to investigate the practicality of applying such media as supplements to the traditional lecture method of instruction for large-sized survey courses in freshman history. The course chosen as the subject for the investigation was a two-semester survey of medieval history.

Four successive objectives were established and carried out in the study:

1. Analysis of subject content areas of medieval history to determine what areas would lend themselves effectively to instruction by means of visual media.

2. Analysis and evaluation of existing available visual aid materials as well as construction of new materials where deficiencies of kind and quality existed.

3. Integration of prepared materials and techniques to actual classroom instruction in a freshman survey lecture course in medieval history.

4. Construction and application of a twofold program for evaluation of the project. The first approach to evaluation was to secure the objective reaction of the students to the new media and techniques as applied in conjunction with the lecture method. The second approach to evaluation was the determination of the instructional effectiveness of the experimental techniques through the application of achievement tests and comparison of results with the achievement of a control group.

In all, some 600 2" x 2" slides were collected from commercial sources or constructed by the research staff; about 400 transparencies for overhead projection also were used. Because of the meager supply of commercially available transparencies in medieval history, most transparencies were produced by the research staff through various photographic and duplicating processes as well as through original art production. They included a wide variety of materials such as maps, map exercises, direct quotations, pictorial illustrations, diagrams and charts of historical concepts, vocabulary studies, lecture outlines, chronology studies and quizzes, and genealogy exercises. The 2" x 2" slides were utilized chiefly to present the development of medieval arts. Available 16mm films were evaluated, and ultimately six were selected on the basis of pertinency and quality for utilization in the project.

The prepared materials and techniques were then utilized in actual instruction on an exploratory basis in a two-semester survey course in medieval history. Two sections of the same course were taught simultaneously by the same instructor. In the control group traditional methods and instructional aids were applied; in the experimental group the prepared media were utilized. For purposes of evaluation, the matched pair technique was applied for both semesters of course work. Pairs were matched on the basis of pretest scores, ACT percentile in social science, ACT general percentiles, and high school history background of the student. The examining instruments were a questionnaire to determine student attitudes toward the new techniques and a posttest in the form of 200 objective questions which was applied at the close of each semester to determine progress scores. The differences in the progress scores were subjected to the T-score formula to determine the significance of difference in mean gains of the paired groups.

For the first semester, the significant difference between the mean gains of the two groups was .7099, which fell below the .05 level of probability (2.064). For the second semester, the difference was 1.833, but still below the .05 level of probability.

Student response to the use of the multimedia techniques was overwhelmingly favorable. In the final group of responses, 51 out of 52 replies endorsed the program as having definite advantages as instructional devices.

The experiment proved the feasibility of adapting multimedia visual aids techniques to college survey history courses taught by the lecture method. Analysis of course content proved that many elements of the content could be adapted effectively to newer media instructional techniques. Both the favorable responses of the students to experimental techniques and the maintenance of a favorable learning progress by the experimental group in comparison with the control group support this conclusion. The increase in the significant difference of the mean gains for the second semester over that of the first semester seems to indicate that further refinement of materials and techniques would result in a significant level of difference between the traditional lecture method and the lecture method supplemented by newer media and techniques.

INSTITUTIONAL INVENTORY

Boston University, Charles River Campus, Boston, Mass. Auditorium of 1,000 seats adapted to integrate a variety of AV media; remote control by instructor of all systems. (Gaylen B. Kelley)

Bowling Green State University, Bowling Green, Ohio. Three large-group instructional rooms being planned for rear projection multimedia use with split screens for simultaneous projection. (Glenn H. Daniels)

California State College at Long Beach. Planning (1967) new multimedia rooms, including videotape and closed-circuit facilities in new library. (George E. Dotson)

Central Connecticut State College, New Britain. Multimedia instruction hall to be completed fall 1967, including TV camera at lectern for image magnification. (Charles A. Herrick)

Foothill College, Los Altos Hills, Calif. Student response system takes roll in 3 seconds, gives test item analysis, cumulative test records for students. (No contact listed)

Illinois State University, Normal. Has 3 multimedia auditoriums in use, another planned; 2 rear projection, 2 front projection. Remote control of equipment is provided. (William C. Prigge)

Illinois Teachers College, Chicago North. Auditorium-Telemation-Responder-Laboratory: Multiscreen rear projection with student response system and computer-controlled presentation. (Charles H. Stamps)

Indiana State University, Terre Haute. Has 2 multimedia rooms of 255 seats each; rear projection equipment, and provision for student response systems. (Russell McDougal)

Los Angeles Valley College, Van Nuys, Calif. Study Skills Center includes programed instructional materials, teaching machines, self-tutoring aids, and Listening Center. (M. Jack Fujimoto)

Meramec Community College, Junior College District of St. Louis — St. Louis County, St. Louis, Mo. Projection systems plus student response can be programed for use independently or in partnership with instructor. (Walter E. Hunter)

Oklahoma State University, Stillwater. A preplanned and completely equipped AV center (July 1967) will encourage faculty members to make maximum use of new media. (J. C. Fitzgerald)

Oral Roberts University, Tulsa, Okla. Multimedia professor's instruction desk combines hinged self-storing lectern, fixed overhead projector, and a compartment containing 35mm slide projector and audiotape recorder. Chalkboards are metal in order to accommodate magnetic display materials. TV monitor is installed separately. (Paul I. McClendon)

Pennsylvania State University, University Park. Has 4 lecture halls seating each 396 students; rear projection central core for slides, films, audiotapes, TV. TV camera in each auditorium for magnification. (Leslie P. Greenhill)

Rensselaer Polytechnic Institute, Troy, N.Y. Has 6 multimedia classrooms and 6 more under construction. Extensively used; complete equipment installations. (William L. Millard)

Southern Illinois University, Carbondale. General classroom building designed for multimedia-supported instruction. Four 300-seat and six 80-seat classrooms. Student response systems planned. (Donald L. Winsor)

State University of New York (SUNY), College at Brockport. A 160-seat teaching auditorium with rear projection is used for simultaneous display of 2 or 3 media in experimental preparation for a new building under construction (1967). (Jack B. Frank)

Syracuse University, Syracuse, N.Y. Student response system in Newhouse Communications Center is connected to a distant computer for rapid print-out. (De Layne Hudspeth)

University of Bridgeport, Bridgeport, Conn. College of Education uses 3 classrooms and a control room to demonstrate to future teachers the applications of large-group instruction. (George E. Ingham)

University of California at San Diego. Student response systems, structured exhibits in hallways, and multidiscipline lecture laboratories with carrels interlinked by CCTV and audio systems. (Charles F. Bridgman)

University of Miami, Coral Gables, Fla. Octagonal building with six 300-seat classrooms and 2 divided classrooms for 100 each, plus smaller rooms behind central core projection. Complete and adaptable installation. (John A. Fiske)

University of Pennsylvania, Philadelphia. Instructional Resources Laboratory has a 50-seat classroom and 10 surrounding rooms, to train teachers in the use of cross-media and multisensory approaches. (Hugh M. Shafer)

Wartburg College, Waverley, Iowa. Permanent self-contained, custom-designed projection facilities in auditorium and lecture room of new (1967) Hall of Science. (R. A. Wiederanders)

Wisconsin State University at Platteville. In about 2 years will have large-group instruction via TV plus EDEX response system. (Glenn G. Brooks)

Wisconsin State University at Stevens Point. Multimedia in history to supplement medieval history lectures. Some 600 slides were collected, and 400 overhead transparencies were produced. Proposed Learning Resources Center (including library) to include campus-wide CCTV and dial-access retrieval in residence halls. (Frederick A. Kremple)

SUMMARY

After reading descriptions submitted by colleges that have constructed multimedia classrooms, and visiting and consulting with the directors of several of them, the HEMS staff is convinced that the multimedia room does enable instructors to realize the goal of quality in large-class instruction — but not without effort. Effective utilization of the multimedia installations seems to require that the instructor be assisted by several technicians: the projectionist to schedule, load, and maintain the several items of projection equipment in the building core; the graphic artist to assist in preparing charts and slides to supplement the lecture; and the audiovisual librarian to suggest sources of tape, film, and video materials that can contribute to the behavorial purposes of the instructor. In addition, the appropriate use of the equipment afforded in the multimedia room requires planning and rehearsal time of the instructor far in excess of that used in preparing the usual lecture. Unless the instructor finds some sort of reward for this additional travail, he is likely to retreat to the practice of using the multimedia classroom simply as another lecture room. This practice was observed several times by the HEMS staff in visits to these facilities.

Thus, again, faculty enthusiasm is the key to realization of the undoubted values of the improved instructional environment in the multimedia room. This enthusiasm seems to be intimately connected to the provision of released time for the necessary planning and of competent paraprofessional technicians to assist in the detail work of certain technical aspects of course preparation and presentation.

X

TRANSPARENCIES FOR OVERHEAD PROJECTION

AS WAS true with the audiotape recorder, so it is also with the overhead projector: few reports of innovative use were submitted by the correspondents to HEMS, although there was evidence that the large transparency remains one of the most effective and widely used of all of the new media. This medium provides an especially simple and economical means of improving instruction through the introduction of impromptu illustrations or through the use of previously prepared projectuals from commercial or local sources. In the classroom little or no expertise is required in making effective use of the equipment; local production of the necessary transparencies, of course, usually implies need for the assistance of a competent graphic artist.

CASE DESCRIPTIONS

Uses of Overhead Transparency Projectors

Mount Saint Mary College, Hooksett, New Hampshire
Sister Mary Boniface, R.S.M.

Mount Saint Mary College (enrollment of 250; with about 40 percent of its students in the teacher preparation program) purchased its first overhead projector for faculty use and a "Secretary" copier and dry photocopier for library use in the fall of 1963. In the two years that followed, only three faculty members, representing two departments, made use of the projector, using handmade transparencies. Other members of the faculty felt the results were not worth the time and effort required.

In June 1965 the College received a $2,000 grant from the 3M Company. The general purpose of the grant was to acquaint future teachers with the available visual materials for overhead projection. The grant consisted of two overhead projectors (one portable), a "Secretary" copier, texts for the teachers, transparency papers and films of all descriptions (both clear and colored), mounting frames, colored adhesives, and 170 sets of originals. Two workshops were given that summer — one for the College faculty and the other for the teachers of local elementary and secondary schools. Results in the college community were quite phenomenal. During the 1966-67 academic year, for example, the audiovisual equipment served many departments including business, home economics, languages, mathematics, music, sciences, and social studies. In addition, transparencies are prepared for nearby schools which are not equipped with a copier but do have projectors.

It is in the area of teacher preparation that overhead projection is most used. Each prospective teacher is given the opportunity to become thoroughly acquainted with the materials and to have minimal practice in their use during one of her methods courses. Overhead projection is used frequently by the instructor before the student is asked to teach a sample lesson based on its use.

An actual case of such a lesson is the teaching of the digestive system in grade 5. The student teacher, in preparing her lesson, decided to use the opaque green film, so that the outline of the various parts of the digestive tract would be clearly defined. However, she soon found that this defeated her purpose, since she intended to label the parts as each was introduced. Unwilling to abandon the clear-cut colored outline against the black field, she cut out the diagram close to the outline and put a sheet of clear film beneath it on the projector stage, on which she could write the names of the parts. As the lesson progressed she found that this was even a better arrangement than making a black-and-white transparency because, in order to review, she simply replaced the used film by a fresh one, eliminating the need to wash off the inked labels.

Currently the social science department is experimenting with map overlays and looks forward to the possibility of having children map out the major movements of the great wars with colored spots to represent armies placed appropriately on overlay maps of the area where the particular battle was fought. These new materials have added another dimension in teaching aids and have helped liven methods courses.

The Modern Mathematics series of transparencies published by 3M Company has been the basis of many lectures to parents in nearby schools by one of the faculty members. These parents are anxious to know about the "new" math their children are learning and have requested the lectures, often scheduled for local parent-teacher meetings. Teachers of these children also have attended the meetings in large numbers and have found them profitable.

This specially designed instructor's desk and podium contains a built-in overhead transparency projector well out of the line of vision of students in the class. (Oral Roberts University)

Acquainting freshmen with the plan of a library, the card catalog system, and how to set up a bibliography have become simplified tasks with the use of overhead projection. Lamination of valuable photographs, maps, and newspaper clippings is another recent development here. Whether for enhancing the beauty of a picture or preserving a document, this method has proved to be most valuable.

The science department has found ready-made transparencies of complex systems as well as simplified explanations of bonding a positive addition to its course work. Many anatomy drawings, formerly traced laboriously by hand and then transferred to a Xerograph master, now can be reproduced in a few seconds for overhead projection with perfect clarity. A most recent use of the projector in the laboratory is to flash on the screen a copy of the setup of an experiment for freshman chemistry classes when none is given in their manual. The third dimension obtainable in such diagrams is most helpful to the student.

Teaching Geographical Concepts and Analysis with Transparencies
St. John College of Cleveland, Cleveland, Ohio
Sister Mary Clareanne, S.N.D.

The overhead projector is an integral part of every geography class at St. John College of Cleveland. Transparencies have been prepared to illustrate the basic principles of physical geography and of map analysis. Furthermore, each student is provided with a duplicated copy of the projection to annotate and label during the lecture and to retain as a summary of the class.

Since geography emphasizes relational thinking, the overhead projector is well suited to this subject. A transparency of one base map with several overlays is used to illustrate the relationship or coincidence of climatic regions with vegetation, soils, land use, and population distributions. Temperature and precipitation data as well as climographs are projected by means of the overhead. Initially, analysis is a class cooperative project through discussion deducing the probable place where the particular temperature and precipitation regime might be characteristic. In this way a student learns how to analyze data found in his supplementary readings on the various world regions.

Students prepare their own visuals to accompany their reports. They are provided with acetate sheets and are assisted in preparing map and graph transparencies to illustrate their talks. This experience of learning and sharing via visuals demonstrates to these future teachers how to teach geography concepts and map skills visually. Later in their social studies methods course they deal specifically with these media in their application to elementary school geography.

The use of transparencies permits the instructor to share and to show diagrams prepared from a great variety of sources. The illustrations in any one adopted textbook are never entirely adequate. New terms are lettered beforehand and projected during the lecture so that terminology and place names will be spelled accurately in the students' notes. The outstanding merit of the overhead projector, however, is that students can be guided and directed in map reading, in discovering areal relationships, and in analyzing a variety of data — population statistics, climatic and economic factors — which characterize each world region.

Wall maps likewise are used extensively by the students principally to locate places during a discussion or to review and/or summarize a lecture. At least once during every lecture the globe is examined for the global position of the respective world region being analyzed, its relation to other places on the curved surface, and the implications of its latitudinal position which can be realized in no better way.

By means of transparencies, the globe, and wall maps, the ideal of two-thirds student participation in every class is achieved: students focus on the projected visual, annotate their individual duplicated copies, handle the globe and demonstrate with it, and point out locations and relations on wall maps. This use of three media stimulates thoughtful analysis and relational thinking, the hallmark of good geography teaching and learning.

Three-Dimensional Color Projection

University of Idaho, Moscow

William B. Hall

The graduate course in photogeology offered by the College of Mines of the University of Idaho uses three-dimensional projection to speed recognition and increase effectiveness of interpretation of air photos. As in most such courses in photo interpretation, there is strong emphasis on the interpretation and evaluation of geologic conditions as shown on stereo pairs of vertical black-and-white air photos.

At the University of Idaho there is also a very substantial investigation of the potential value of three-dimensional color air oblique photo pairs in geologic interpretation. With special 35mm cameras, oblique air photos are taken of areas of geologic interest and are processed to color transparencies of normal 24mm x 36mm format. For classroom study these slides are projected, using a modified TDC stereo projector, onto a silvered screen. The class uses polarizing spectacles and can see the aerial view in color and in stereo. The instructor can then discuss the geologic setting of the area and ask for class interpretation of the view shown. Many variations of class usage are possible depending on the aim of the instructor. It is also possible to transfer the information to topographic maps of the same area when the map scales are appropriate.

A Transparency Reproduction Center

University of Massachusetts, Amherst

Nathan S. Tilley

The Transparency Reproduction Center at the University of Massachusetts was established to enable professors throughout the campus to have transparencies for the overhead projector made for their use in teaching — no matter what the subject. The Center now has on file more than 10,000 masters from which transparencies can be made. These were obtained from commercial and educational sources.

Included in the equipment for transparency production are heat, dry transfer, and Diazo printers for individual and experimental transparencies. An Ozalid "Ozamatic" machine also is used for large production runs. Cameras, lettering devices, and coloring supplies are available for specialized transparencies.

Because many transparencies are custom-made for specialized use by a particular instructor, a full-time graphic artist is employed for art work and individualized masters. A staff photographer also is employed to reproduce, enlarge, or reduce art work to suit the particular subject matter. Masters of all individualized transparencies are left on file for possible future use by others and for reference. Many valuable line drawings and coarse-screened illustrations obtained from magazines, newspapers, and books (with copyright permission) have been found invaluable in building up the picture file.

All originals or masters are filed for easy reference under subject headings such as Geography, History, Mathematics, Science, English, Foreign Language, Physical Education, Art, Business, Vocational Education, and the like. A cross-index card file also is being established for specific categories.

A specialized part of the Transparency Reproduction Center is the establishment of the Northeast Regional Media Center for the Deaf at the University of Massachusetts sponsored through the U.S. Office of Education. Besides traveling demonstrations to various schools of the deaf throughout the Northeast, the Center furnishes transparencies to such schools for their use in teaching. The development of research into teaching of the deaf with the overhead projector appears to be of prime importance to the project.

Official photograph, U.S. Navy

Local production of slides and transparencies provides essential support to college and university instruction.

Also in connection with this USOE project the University of Massachusetts (and with three other universities) presents an institute each summer for the purpose of training teachers of the deaf in the fundamentals and uses of newer media. A course of study leading to a master's degree in newer media (incorporating a library science course) for teachers of the deaf is being developed.

INSTITUTIONAL INVENTORY

Clemson University, Clemson, S.C. Low-cost transparencies are produced by Clemson for distribution to each vocational teacher in South Carolina. (Arthur K. Jensen)

Fairmont State College, Fairmont, W. Va. Locally made transparencies used widely in teacher education. (Stark A. Wilmoth)

Hahnemann Medical College and Hospital, Philadelphia, Pa. Clinical students in obstetrics and gynecology are provided with transparencies and projectors at the hospital for study during waiting periods ("times of brief idleness") to supplement other kinds of learning. (Lawrence McGowan, M.D.)

Illinois State University, Normal. Production laboratory in AV Center uses 3 student graphic artists and provides transparencies and 2" x 2" slides for all departments. (William C. Prigge)

Junior College District of St. Louis—St. Louis County, St. Louis, Mo. Large collection of color slides used in art and art appreciation. Analysis made of paintings and drawings by means of a 2-projector overlay technique. (David Underwood)

Marygrove College, Detroit, Mich. Substitute for classroom observation provided in teacher training by means of "audio-slide" sequences: tape of lesson is synchronized with colored slides. (Sister Mary Gilmary)

Mount Saint Mary College, Hooksett, N.H. In teacher preparation, transparencies are prepared for all departments of the College, and students are taught how to make and use transparencies and overlays. Used in history, mathematics, library usage, science. (Sister Mary Boniface, R.S.M.)

Oklahoma State University, Stillwater. When a state specialist meets with county or regional supervisors to explain a new farm project or federal program, he reproduces his visuals so that each local supervisor may have a copy. In one case, this meant that the University prepared 92 sets with 40 transparencies each. (J. C. Fitzgerald)

Rensselaer Polytechnic Institute, Troy, N.Y. Used either singly or in combinations of 4 to 6 overlays, transparencies are produced to illustrate such concepts as resolution of vectors, electron drift; some "technamated" to show motion patterns. (Walter Eppenstein)

St. John College of Cleveland, Cleveland, Ohio. Overhead transparencies used in geography to illustrate physical geography and map analysis. Students are issued duplicated copies of projectuals for labeling, notes, summary. (Sister Mary Clareanne, S.N.D.)

State University of New York (SUNY), College at Oswego. Trays of slides are set up to go with each presentation in music history and appreciation. Synchronized tape-slides for individual study are planned. (Paul W. Rogers)

University of Colorado, Boulder. Use is made of builders' polyethylene sheets (4 mil thickness) with typing carbon paper (1 above and 1 below) and type on the polyethylene. (Otis McBride)

University of Idaho, Moscow. In photogeology, 3-dimensional color air oblique photo pairs are coupled with student polarizing spectacles, for geologic interpretation. (William B. Hall)

University of Massachusetts, Amherst. Transparency Reproduction Center on campus catalogs more than 10,000 masters from which transparencies can be made or magnified; a project is under way to investigate use of overhead projectors in teaching the deaf. (Nathan S. Tilley)

University of Pittsburgh, Pittsburgh, Pa. All freshman English instructors use overhead projectors to project and criticize student writing. (Edwin L. Peterson)

University of Texas, Austin. Colored transparencies are used to replace chalkboard drawings in teaching engineering, descriptive geometry, and an increasing number of other courses. (Clayton W. Chance)

Wesley College, Dover, Del. Transparencies used in language, mathematics, chemistry, English, history, physics, psychology, business, and biology. (Richard L. Titus)

Wisconsin State University at Stevens Point. About 500 slides and 400 transparencies have been assembled for a survey course in medieval history. In paired comparison with "conventional" course by same instructor, NSD in tests, strong student approval. (Frederick A. Kremple)

SUMMARY

Conversations with several directors of learning resources in the colleges and universities visited indicate two conditions that will encourage competent use of overhead projection in teaching: first, the department of learning resources should provide competent graphic artists and photographers to work with instructors in developing and producing transparencies for class use, without burdening the budget of the separate instructional departments; second, consultants with competence both in the audiovisual field and in an academic discipline should be employed to help instructors analyze their courses and develop ideas for transparencies (or other visuals as appropriate) that would improve their presentations.

Based on the observations of the HEMS staff and the enthusiasm of the authors who have reported their applications of the equipment, it seems reasonable to suggest that investment in overhead projection equipment might be one of the most rewarding approaches to improved college instruction. Nearly all instructors could find a use for this technique in their classes, at least all who have previously used the chalkboard; and the experience of cooperating with a willing graphics expert and a competent subject matter consultant on visuals would no doubt encourage many faculty members to experiment in making further instructional applications of other sorts of instructional hardware. The key condition for effective use, to repeat, seems to be the kind of institution-wide encouragement that is signified by the provision of centrally budgeted assistance of technicians and faculty persons for the instructor who desires to improve his teaching.

XI

TELEPHONE APPLICATIONS TO INSTRUCTION

THE basic application of the lecture by telephone, or "telelecture," is described in *New Media in Higher Education* (1963).* Many colleges have since made excellent use of this technique to avail themselves of the instructional contributions of guests who cannot come to campus but are willing to devote some time to a telephone dialogue with a remote class. Visitors from abroad or important governmental or scientific personalities may find it difficult or expensive to travel to a campus but quite possible and satisfactory to sit at a telephone and be interviewed for instructional purposes.

A somewhat different and more structured use of the telelecture is reported from the medical schools in one of the small states. In a program supported entirely by members of the medical profession, formal medical lectures from the two medical colleges in the state are phoned to community hospitals, where a room is equipped for listening by members of the medical and paramedical staffs. When the lecture is scheduled in advance, charts and slides are sent out to each hospital in advance of the presentation. In addition, the hospitals are encouraged to tape the lectures, so that additional physicians may hear and see the presentation at more convenient times. In such cases the "live" listeners may ask questions, and all listeners in the network can hear both the questions and the answers. At times, specialists in the medical schools also can present their discussions of clinical cases to practitioners in other hospitals by this same network; advance distribution of visuals may not be possible, but the teaching physician can be especially careful to give complete verbal descriptions of the pathology he is discussing. Telewriter installations also may be used in such instances to provide at various remote locations accompanying sets of correlated drawings (done by hand and transmitted instantaneously to the distant points of use).

CASE DESCRIPTIONS

Telelectures Overcome Distance in Off-Campus Instruction

New Mexico Highlands University, Las Vegas

Gordon E. Patterson and John J. Johnson

It was a Highlands University graduate class entitled Administering Audiovisual Services, and the author of the text for the course was deep in a discussion with the students about problems of instruction that the class had identified the previous week. The students were experienced teachers, the discussion leader was an outstanding authority, and the give-and-take conversation was lively. Teachers taking the class represented four school systems in New Mexico: Bernalillo (48 miles south of Santa Fe), Espanola (25 miles north of Santa Fe), Santa Fe, and Las Vegas (66 miles east of Santa Fe).

What made this stimulating evening class meeting of particular interest for this report is the fact that the discussion leader spoke from his study in San Jose, California; the instructor was with the Las Vegas teachers in a classroom on the Highlands campus; and the Bernalillo, Espanola, and Santa Fe teachers were grouped around a large conference table in the Santa Fe high school library. The discussion leader used his ordinary telephone in this long-distance party-line discussion; the teachers heard his voice through speakers and asked questions of the leader and each other through microphones.

Distance and time for travel no longer influence the organization of evening classes for teachers who wish to study and master new techniques in instruction or learn of new theories in education or upgrade their understanding of rapidly developing subject areas. Off-campus classes now can be established in remote and mountainous areas of Northern New Mexico and be taught through the simple expedient of dialing in a class. For greater flexibility, lectures and discussions can be punctuated with films, filmstrips, and overhead and opaque projectors, the only requirement being that of duplicate hardware and software and competent operators at both ends.

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* Op. cit., pp. 99-100.

The experimental class referred to earlier in this report was organized to test the idea of simultaneous instruction in widely separated communities. The class met regularly for 3 hours one evening each week for 8 weeks. The instructor alternated each week between the two class sections (cutting his travel in half). A mature student was designated in each section to be responsible for the equipment.

The instructor customarily has conducted his classes with lecture at a minimum and student participation at a maximum. The telelectured class stimulated a greater than normal student participation. Discussions toward the end of the course became very animated and probing. There were fewer distractions to disrupt a discussion.

The evaluation of this class disclosed that achievement (reflected by tests administered to the students) was maintained at the same level as that experienced in regular classes on campus. Student acceptance of this technique has been surprisingly high. Instructors must plan carefully for telelectured class sessions, but, once they understand the capacities and limitations of the equipment, they can conduct their classes without either loss of quality or effectiveness of instruction.

Highlands University will use the telelecture technique again in its extension program. Off-campus classes will be established in areas not now possible to serve. The well established on-campus evening schedule of classes will be "tapped." Instructors will stay on the campus, and the Extension Services personnel will do the traveling necessary to organize and maintain off-campus instruction.

Remote Blackboard Use

New Mexico State University, University Park

W. B. O'Donnell

New Mexico State University has accepted responsibility in meeting the higher educational needs of the State of New Mexico. The University directs the activities of several branch colleges, one located 400 miles away. It also has conducted undergraduate and graduate classes at the White Sands Missile Range which is located 30 miles away. Resident faculty handle the programs at the remote locations, while at the closer locations faculty commute from the main campus. In the interest of broadening the interaction of the campus faculty with the off-campus programs, the University has installed a remote blackboard fa-

cility which was used for regular classes for the first time during the fall of 1966. Previous programs during the spring and summer were primarily experimental in nature.

The instructor occupies a small office in one of the campus buildings, equipped with a handwriting transmitter, using a dataphone link and a headset for audio communication between the instructor and one or more classes. At present the equipment is used simultaneously in two separate classrooms which are 30 miles apart. Each of these classrooms is equipped with a speaker and microphone to permit the students to hear the instructor and converse with him. The classroom also is equipped with a handwriting receiver mounted on an overhead projector. Material written by the instructor is projected on screens located at the front of each classroom. Telephone lines connect the instructor with the classrooms and are paid for at local telephone rates for private lines. The rates for the more distant locations will be long-distance rates.

In 1966-67 three courses were offered via this facility, two in senior physics and one in mathematics. Approximately 150 students were enrolled in the three courses.

In the future a much wider part of the campus educational program will be offered at White Sands Missile Range, the branch colleges, and other federal and community installations. This will be possible inasmuch as the faculty will not need to commute. Courses for relatively small classes are financially practical using the remote blackboard. Special lectures and short courses which are not a regular part of the campus academic program likewise will be carried in this fashion, particularly in the physical sciences and in engineering.

The off-campus classes have met the new medium with enthusiasm. The remote blackboard program is new and has not yet been evaluated for effectiveness in teaching. Plans call for a careful evaluation of the system as to instructor as well as student acceptance and performance. Students will register for classes via remote blackboard at the same cost as for the classes offered on campus. The program is in its infancy, and its development will depend largely on its acceptance by the teachers and students.

The Use of Amplified Telephone for Interviews and Classroom Teaching

Stephens College, Columbia, Missouri

James A. Burkhart

A conventional telephone equipped with an amplification unit can bring an unlimited number of resource persons into the college classroom. Through telephonic techniques, students can hear amplified comments of respondents and participate at will in these long-distance discussions.

The course in American government at Stephens College was a natural laboratory for experimenting with the telelecture. For years the course had attempted to bridge the gap between the textbook and

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the wider world of political action, to break down stereotypes on politics and politicians, and to present government as a dynamic process. During the school year 1958-59, the amplified telephone interview was used in this course rather informally. Calls were made to a number of important persons — James C. Hagerty, Barry Goldwater, Chester Bowles — and to local and state officials. Students found that ensuing interviews gave issues a ring of reality and a feeling of person-to-person conversation. Insights into personalities, philosophies, and responses of creative minds to current problems were outcomes of these experiences.

Results of the first year seemed to justify further experimentation with telephonic techniques of instruction. Supported by a grant from the U.S. Office of Education, a controlled experiment was conducted in 1959-60 in four courses — American Government, Masterpieces of World Literature, Introduction to Business, and Basic Beliefs in Human Experience. The procedure in each course was the same: one section was taught in the conventional manner while another was taught experimentally with amplified telephone interviews. When interviews were used, the instructor either introduced the topic and the interviewee and turned the interrogation over to the students or conducted the interview while students took notes.

Since 1960, amplified telephone interviews have been used regularly in a number of other classes and for a variety of purposes (interviewing alumnae on aspects of the counseling program; in-service staff training with interviews on testing, admission policies, audiovisual methods, and others).

The amplified telephone continues to find useful application at Stephens College. Perhaps the most dramatic recent extension of the technique has been the adaptation of the conference telephone hookup to teaching. Under this arrangement a telephone network is used to bring an outstanding lecturer to a group of colleges. Courses in literature, science, and contemporary affairs have been offered simultaneously to a cluster of colleges. Currently (1967), six colleges are cooperating in a 2-year program in which Contemporary Literature, Great Issues, and other courses will be taught by amplified telephone. One course will be offered each semester. The colleges participating in the program are Stephens College, Bishop University, Drury College, Langston University, LeMoyne College, Westminster College, and Central Methodist College.

Recently (1967) Stephens College was awarded a Summer NDEA Institute for high school history teachers. One of the features of the Institute was the use of this medium to interview outstanding historians.

Telelectures
University of Colorado, Boulder
Louis Brown

The telelecture consists of arranging with the local telephone company a long-distance telephone communication employing a microphone for input and speakers for output. The primary speaker is asked to prepare a script along with appropriate visuals to be sent to each receiving station.

Depending on the sophistication of the presentation, someone is usually required to be on hand at the receiving point to coordinate the projection and to check on the adequacy of the telephone installed equipment. Telephone company people are usually most capable; when requirements are clear there is little concern about technical facilities.

One example of the telelecture was an alumni meeting with groups in four different cities listening and viewing a presentation by the president of the University of Colorado. After the formal speech, the president engaged all the groups in a two-way conversation. The Extension Division has developed similar presentations so that they are commonplace events at conferences and institutes.

Costs will vary according to the individual arrangements made with the telephone company. There are no reasonable limitations as to the number of receiving stations that may be included in a telelecture hookup. An overseas connection can be arranged.

There are variations in the approaches employed. As in the above example, the communication lines may be set up for an entire presentation. Where appropriate, packaged programs from a single audiotape to an audio and visual presentation may be given. This latter approach is then followed up by a telelecture arrangement for a follow-up and/or discussion of the packaged program.

For more sophisticated applications a telewriter is available by means of which the speaker and his projectuals are transmitted to a screen at the receiving location. The use at the University of Colorado varies with campus activities, but it is not uncommon to schedule four or five telelectures per week.

Remote Teaching
University of Missouri at St. Louis
John J. Boswell and Donald W. Mocker

Present demands on institutions of higher learning call for an immediate and well planned alteration in traditional methods of extending facilities of those institutions to remote areas. Such demands have stimulated the University of Missouri at St. Louis to initiate a program of research on how best to meet its commitment to students throughout the state who do not have easy access to the campus. Among the problems concerned with off-campus teaching is the number of hours spent by instructors traveling from the resident campus to the off-campus class. Often an instructor will spend more hours on the highway than in the classroom.

To help alleviate this problem, telephone lines were leased from St. Louis to the Mineral Area College in Flat River, Missouri, 85 miles away, to be used in conjunction with telelecture and remote blackboard equipment. If an effective teaching job can be done using this hardware, then a great portion of nonproductive travel time can be eliminated, and faculty hours can be freed for more rewarding activity.

The apparatus consists of two remote blackboards, two standard classroom projector screens, and a two-way audio telelecture unit. The lecturer writes or draws schematics on the sender console of the remote blackboard, positioned on a desk in the front of the live lecture hall. He uses a special ball point pen linked with a set of X, Y grid motors. Impulses from these motors are relayed to receiver-projector units in the rear of the live lecture and remote classrooms, where identical motors are activated to reproduce the message on a permanent record type acetate tape. This tape is positioned for projection through overhead projectors to viewing screens placed at the front of both classrooms. Audio portions of the lecture are transmitted via a lavaliere microphone with an extension cord long enough to permit freedom of movement. High-intensity microphones and speakers are located in Flat River to permit students to listen or ask questions from their desks. A speaker placed on the lecturer's desk in the live lecture hall completes this audio hookup.

The present study was designed to determine the effect of the hardware on simultaneous classes and the efficacy of the technique for remote teaching. Three groups of students were involved. One group was a control group which received a traditional lecture on the St. Louis campus. The second group, also in St. Louis, received a live lecture which was simultaneously transmitted to the third group located in Flat River, Missouri. The same teacher presented lectures based on a single set of notes to all groups. An effort was made to ensure equality in terms of class discussions and teacher contact. A senior undergraduate served as in-class teaching assistant for the Flat River group. His task was to observe and report conditions in the remote classroom during the lecture period and to interact with the students prior to and following the class and during break periods. In addition this assistant was prepared to take immediate action in case of some malfunction in the equipment. Pre- and post-tests were administered to all groups. Additional behavioral observations were made throughout the semester, and a teacher-class evaluation form was completed at the end of the course. The results showed no differences among pretest scores. Similarly, there were no significant differences among posttest scores, as was the case with behavioral observation data. The students' response to the teacher-class evaluation forms also failed to show systematic differences among the groups.

These early results hold important implications for the urban university, since they strongly suggest the technique may represent an economic and usable vehicle for extending the facilities of the campus. Additionally, the technique holds promise of reducing the time lag between research and the dissemination of the results of this research to the interested people throughout the state.

The University of Missouri at St. Louis not only hopes to use this equipment to extend formal credit courses to people far from the resident campus, but also hopes to facilitate the transmission of other educational services such as conferences, short courses, and lectures that will help the people of Missouri continue their education. As additional segments of the design are completed the results will be presented for consideration.

INSTITUTIONAL INVENTORY

Johns Hopkins University, School of Medicine, Baltimore, Md. Maryland's 2 medical schools are linked by private telephone to many of the community hospitals of the state. Formal medical lectures are phoned, with visual and printed material sent to each hospital in advance. Questions are possible from any of the hospitals. "Grand rounds" can also be transmitted, but usually without visuals (too current for advance preparation). (F. J. Heldrich, Jr., M.D.)

Memphis State University, Memphis, Tenn. Telelectures from Indiana University to Memphis State University began in 1967. Use will be extended. (Ronald S. Alford)

New Mexico Highlands University, Las Vegas. Description of a telelecture delivered to 2 separate classrooms in New Mexico from San Jose, California. Two-way communication was possible for all students. (Gordon E. Patterson and John J. Johnson)

New Mexico State University, University Park. Telephone plus remote blackboard to distant classrooms. Handwriting receiver is mounted on overhead projector and projected in front of distant classroom. Used in mathematics and in physics classes. (W. B. O'Donnell)

Stephens College, Columbia, Mo. Amplified telephone supplemented by "Electrowriter" used as a teaching medium in two courses, joining 16 colleges in 10 states. (James A. Burkhart)

University of Colorado, Boulder. Speaker sends appropriate visuals before telelecture is presented. Four alumni groups heard address by president of the University, with visuals. (Louis Brown)

University of Hawaii, Honolulu. Telelecture from Honolulu was delivered at Hofstra University in New York; 5-hour time difference had to be allowed for. (Walter A. Wittich)

University of Missouri at Rolla. Combination of telewriter and telelecturer in off-campus engineering instruction and in humanities. (L. W. Martin)

University of Missouri at St. Louis. Extension uses telelecture and remote blackboards, and projector screens. Experimental results showed no significant difference in achievement of three groups. (John J. Boswell and Donald W. Mocker)

University of Washington, Seattle. Telelecture from Purdue University to University of Washington in Seattle. Illustrations changed by the speaker in Indiana. (Boyd F. Baldwin)

West Virginia Wesleyan College, Buckhannon. Mobile telelecture equipment is leased from telephone company, and many classrooms are provided with connections for it. Students on distant campuses have carried on discussions via this hookup; slide tape presentations have been presented before the actual telelecture. (Walter L. Brown)

SUMMARY

The reported imaginative uses of the telephone or telephone facilities suggest numerous opportunities for continuing education and for keeping up-to-date with most recent developments, for physicians, for scientists in industry, or for any groups with similar interests who may be congregated to learn in some convenient spot. The simplicity of the technique and its utilization of already installed commercial transmission lines commend it for further study and experimentation. It appears quite certain that this is a field in which much development work will be done by the interested telephone companies themselves — especially with respect to the design and improvement of necessary equipment.

XII

SIMULATION

THE technique of simulation of life situations for instructional purposes was rarely reported as an operational technique in colleges and universities that corresponded with HEMS. However, industries associated with education reported experimentation with the simulation method in the education of business graduate students, educational administrators, and physicians. As an example, school superintendent trainees are provided with a series of "in-basket" problems; their learning experience is to decide what additional information they need to arrive at a decision for action. In the model being developed, a computer is used to provide the student with the information asked for.

In medical education, also, a case description is presented to the intern, and the quality of his competence is demonstrated by the kinds of further questions he asks or the depth of further information he expresses the need for before developing a diagnosis rather than by the rapidity with which he reaches a conclusion and prescribes a course of action.

Another of the HEMS reports discussed in the section following involves the use of simulation in preparing supervisors of student teachers. Slides and tape recordings are shown to prospective supervisors, teachers in the public schools, presenting good and inadequate examples of student teacher performance. The teachers then write reactions to the several episodes and discuss as a group their counsel to the student teachers in each situation.

CASE DESCRIPTIONS

Simulation Techniques Using Low-Cost Media

Marygrove College, Detroit, Michigan

Sister Mary Gilmary

Since today all teacher training institutions face shortages of observational opportunities and student encounters with the teaching and learning in a normal classroom, a program of audio-slide sequences has been developed at Marygrove College which can be used to simulate classroom situations and which is able to demonstrate techniques for teaching specific subject matter to children. For these sequences actual classroom lessons are taped during real teaching situations. After completion of any one lesson, colored slide pictures are taken of the now reenacted sequence. Then in a small work area of the elementary school office, the sight and sound involved are synchronized and clued electronically so that the program can be played back later in a college methods course. Through the use of a 4-inch lens with proper focal length, almost life-size projection is possible. When the video portion is thus combined with strategic placement of dual speakers, there is a resulting illusion of reality.

Although the initial objective of the program is to provide well structured, indirect experience with children in specific teaching-learning situations, many other objectives can be obtained through the use of audio-slides:

- To give the entering education students a preview of classroom situations without unnecessary distractions.
- To help novice students observe differing reactions of differing age levels in various learning situations.
- To enable students who are taking a methods course to observe theory in practice more immediately.
- To enable students to focus on technique and teacher-pupil interaction in isolation so they will be better prepared when they teach in a live classroom.
- To introduce the students to some of the problems and procedures of dealing with educationally disadvantaged children.

- To help students develop a facility in evaluation of classroom procedures through frank discussions of other student teachers' procedures.

From the viewpoint of the college instructor there are other advantages: the program may be stopped at any point for immediate discussion; any specific part of the program may be replayed as desired; the students may view any of the programs independently as individual assignments or as supplements to study; because the programs are so economically produced they may be very easily kept up-to-date or be produced to meet local needs; and, inasmuch as the very act of the instructor in producing the program forces him to evaluate its content and technical aspects, it provides a functional motive for continuing evaluation of teaching techniques.

In the judgment of students who have used the audio-slide sequences, these conclusions seem to apply:

- After a few seconds of viewing the audio-slides, an illusion of reality and even of movement occurs so that the students have the feeling of having actually participated in an ongoing situation.
- The opportunity to observe and react to a situation which the instructor has also observed increases the evaluative aspects of the observation.
- The opportunity to see another student teacher in action and be able to evaluate her teaching procedures is almost as helpful as if each of the students had been the immediate subject.
- The possibility of viewing an audio-slide independently, using headphones and being able to stop a sequence at any point, gives each student the feeling of having a private classroom at her own disposal for learning more about children and the teaching-learning process.

In an endeavor to add a new dimension to the already existing program, the education department is experimenting with Super 8mm film for use in the Audio-Sell machine which combines single-concept film cartridges with a cartridge tape recorder. Through this simple and fairly inexpensive device, the department hopes to broaden its program of indirect experiences to include microviewing of discipline problems and other emotion-laden situations requiring the viewing student to make a judgment. On the basis of the student responses alternative cartridges will be played to simulate the probable behavior resulting from the student judgment.

Classroom Simulation

Oregon State System of Higher Education, Monmouth

Bert Y. Kersh and Paul A. Twelker

Beginning teachers usually have relatively little opportunity to practice teaching skills under expert supervision. The shortage of qualified supervising teachers conveniently near the training institution, limited training facilities, and scarcity of expert supervisors on college faculties dictate that new methods be found to provide systematic opportunities for practice teaching.

In 1961 pilot work was begun on a promising new approach to teacher education which utilizes sound motion pictures and various printed materials to simulate classroom situations. In a facility called the Classroom Simulator, multiple projection techniques are used to present realistic problems to which student teachers are asked to react as if they were in an actual classroom. Depending on their reactions, different feedback sequences are selected for projection. A feedback sequence is a short film showing the most likely response of the simulated class to the teacher's behavior.

Simulation training enables a student teacher to practice the discrimination of cues which signal problems requiring immediate attention. Such training may aid teachers in spotting potential problems in classroom activities. Laboratory simulation also permits the student teacher to practice decision making without fear of censure or embarrassment. A student learns how to fill the role of the student teacher in the classroom by participating in a comparable role in a simulated situation. Finally, simulation training enables a student to look ahead. It enables him to discover some of the possible consequences of various actions that he makes in the classroom. In short, the student teacher may practice changing his behavior in view of the feedback he receives.

With the prototype simulation facility as it has been developed, the learner stands in a position relatively close to a large rear projection screen; he is observed by the instructor from the side. The large screen (which permits projection of a life-size image) and the use of appropriate stage props help to create an illusion of reality. Problems are presented by three 16mm projectors controlled remotely by the instructor, who starts and stops projectors and selects from among the films sequences desired.

To date, a single classroom of sixth-graders has been simulated for use in research projects supported by the U.S. Office of Education. These projects have studied realism variables such as size of image, mode of feedback, mode of response, and motion of the projected image. More recently, prompting and sequence variables have been studied as instructional variables. Findings have suggested that realism in simulation and prompting are not crucial variables in enhancing transfer, in comparison with instructor differences and, possibly, length of training.

The prototype materials present 60 different film situations, each requiring student teacher reactions in handling problems of management and control. At present, a curriculum development effort is under way at the Teaching Research Division to produce new, more practicable simulation packages for training teachers in the "discovery teaching" method as well as classroom control. These new simulation packages will be designed to allow their use in a wide variety of circumstances. They may be adapted for

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self-instructional use or for group use as well as for use in a special laboratory as described above.

Presently (1967), the prototype materials are being used in teacher education courses at Oregon College of Education and the University of Oregon. As a direct result of the work on classroom simulation, other laboratory simulation techniques have been developed by the research staff. Simulation techniques for training teachers how to recognize reading problems and for training dental students in handling clinical emergencies have been produced. Also, the use of simulated classroom problems as test stimuli has been researched. This use of simulation offers a highly effective way of predicting the effectiveness of instructors in the classrooms. Other applications of the laboratory simulation technique are being explored.

INSTITUTIONAL INVENTORY

Concordia College, St. Paul, Minn. Supervising teachers for student teachers were trained by viewing overhead projected samples of 2 hypothetical student teachers, hearing tapes, and written and discussion reactions and counsel to the student teachers.

Marygrove College, Detroit, Mich. Classroom situations simulated by means of audio-slide sequences. Actual classroom lessons are taped; after completion of real lesson, colored slide pictures are taken of the now reenacted sequence. Sight and sound are electronically cued to play back in college methods course. Plan to extend program by producing 8mm single-concept film; will allow microviewing of discipline problems and emotion-laden situations requiring judgment of the student. (Sister Mary Gilmary)

Oregon State System of Higher Education, Monmouth. Classroom Simulator presents films of classroom problems, followed by different resultant situations developing from observer's reaction. (Bert Y. Kersh and Paul A. Twelker)

San Francisco Theological Seminary, San Anselmo, Calif. The Ministry III course utilizes a descriptive model of a "real" urban community called Augustine City, providing students with lifelike situations encountered daily by ministers in the field. Each simulation period represents one quarter of a church year. At the beginning of each class period, each student receives feedback from his decisions of the previous church quarter; detailed reactions to policies, sermons, etc. (Robert Lee)

SUMMARY

Simulation techniques give promise of usefulness in professional training in medicine, dentistry, teaching, and school administration, as well as in continuing education of professionals. The application of "games theory" to higher education merits further experimentation and practical application.

The paucity of experience in the use of simulation in college instruction may be deduced from the fact that no examples other than the four summarized in this chapter were written for the report.

XIII

SYSTEMS

THERE are promising signs across the country that despite soaring increases in college enrollments and accompanying financial pressures, many institutions of higher learning seek to improve the overall quality of their instructional programs. In doing this, they acknowledge that while the "Mark Hopkins and the log" concept of one student confronting one professor is sometimes thought to be the ideal teaching relationship (itself a debatable point, of course), today's economic realities demand other more practical configurations. They call for making the best and most economical uses of professorial talent, of teaching spaces and facilities, of specialized backup talents, and of the myriad teaching-learning resources (notably the "new media") now available or soon to become available to higher education.

It would appear that today's economic realities in higher education require, above all else, that a proper distinction be made between the acts of *teaching* and *informing*. Making and accepting this distinction is believed to be the first important step toward alleviating some of the problems now facing higher education. Two things especially seem to be needed: (a) wider understanding of the fact that simple *informing* may often be performed quite adequately (and economically) through the use of materials or the software produced for use in various electromechanical devices (audio-tutorial or listening laboratories, computer-assisted instructional systems, multimedia installations, TV networks, and the like); and (b) a better understanding of the fact that, as always, *teaching* continues to require (more than informing) the in-person contributions of professors in illuminating, elaborating, questioning, and evaluating, and in managing the necessary give-and-take involved in exchange of ideas with students.

While the search for achievement of optimum conditions for informing and teaching is usually implied in descriptions of "the systems approach," the term itself is difficult to define. One attempt at definition, however, is as follows:

> The materials, equipment, and other interrelated elements (including human components) of an assemblage that operates in an organized manner in handling the appropriate encoding of instructional messages and the distribution, use, and refinement of information. To be effective, such a system must be sensitive to various stimuli and include elements for appropriate response, feedback, and adjustment.

In its simplest form, the development of an instructional system for the entire curriculum of an institution of higher learning is likely to involve several procedural steps, as follows:

1. Clearly define instructional goals; state them in operational, measurable terms.

2. Define efficient ways of carrying out these functions, giving due regard to machines, materials, and human capabilities and to their interactions in a system.

3. Determine functions related to the achievement of those goals that may be performed adequately (or best, or most economically) by (a) *instruments alone* — mechanical, electronic, electrical — in some of which materials (films, recordings, videotapes, and the like) are used; (b) *nontechnical materials alone* (books, programed texts, syllabi, etc.); or (c) *human beings* — students or teachers, alone or in appropriate combinations with other persons, instruments, or materials.

4. With the "human" functions, further distinguish those likely to be performed most effectively by (a)

one student working alone, as in a study carrel; (b) one or two students working with an instructor — as in a tutorial or dialogue; (c) small groups of students working with or without instructors; (d) instruction in medium-sized groups (from 20 to 60); (e) large-group "in-person" instruction (up to several hundred persons taught simultaneously, for example, in a large auditorium); or (f) instruction in "super-large" groups, as in the case of the televised course presentations that are distributed live to viewing groups in various parts of the campus, or for that matter, of the state or nation.

5. Study available professorial as well as nonprofessorial backup talent to discover persons with special capabilities and interest in performing the instructional tasks described.

6. Study the students to discover those who appear to be most capable of profiting from participation in the various alternative types of learning activities. (Some might prefer and be capable of handling independent study activities, for example, whereas others would flounder without more direct instructor guidance.)

7. Survey technical and nontechnical resources, physical facilities, support services, budgets, and policies with a view toward improving or expanding them, as necessary, to meet requirements of the system. The library, the audiovisual center, the listening laboratory, the independent study facility, and other such units are considered integral, not supplementary, to the system's success.

8. Evaluate regularly, feed back data, change and improve as called for, with due regard to original objectives.

The "instructional systems approach" in use throughout various departments of Oakland Community College embodies most of the elements just enumerated under a plan that emphasizes self-instruction and the use of a wide variety of educational media. There the plan entails considerable independent study in a so-called "learning laboratory," a few motivationally oriented general meetings, and frequent student-faculty personal contacts. With this program it was necessary to provide special training for the faculty in writing behavioral objectives for every unit of every course offered (now more than a hundred) in this way. Processes to be followed by the learner were specified in exact detail. Instructional resources required to accomplish learning goals (printed materials, single-concept films, audiotapes, slides, transparencies, graphics, displays, quizzes and examinations) were obtained from existing sources or developed locally. The intended contribution of each such resource to achievement of learning goals is made clear in accompanying study guides. Official documents state that —

> The long-range objective of . . . the instructional program is the development of a multimedia approach which orchestrates media into a multi-path learning experience which will be adaptive to the needs of students of varying abilities and needs and which frees both faculty and student for more intensive contact.

The Oakland Community College program, and a growing number of others like it now developing across the country, take as their model the independent study method of learning developed for single courses by Professor S. N. Postlethwait, Botany Department, Purdue University. There, too, self-instruction, the key, includes uses of such media as audiotapes, visual displays, books, periodicals, laboratory experimental setups, and programed materials. Under the Postlethwait plan, faculty members devote a considerable amount of their free time to development of materials, to improvement of self-instruction routines, and to individual student contact — the latter on a "need to know" basis. Large- and small-group assembly sessions are held on a regularly scheduled basis, during which the faculty discuss course objectives, present new data, suggest applications of subject matter, and generally attempt to integrate course content with other areas of the educational program. Student achievement is evaluated regularly through written or performance tests and oral quizzes.

The Educational Development Program of Michigan State University also includes most of the elements of the systems approach to instruction, with emphasis on the study, analysis, and improvement of teaching and learning on a single-course basis. Developed under the guidance of John Barson, this program is aimed toward making a procedural and cost analysis of media in instructional systems development in higher education. The project is described by its director as offering —

> Instructional development assistance to faculty members in selected courses. . . . This aid is provided by a three-man team consisting of an instructional specialist, a media specialist, and an evaluation specialist. The courses must enroll a minimum of 500 students per year.

While the plan as developed at Michigan State could be applied quite easily to the entire curriculum of an institution, as at Oakland Community College, the emphasis, instead, is on achieving such improvements on a course-by-course basis. This latter gradual approach seems more likely to succeed in obtaining the benefits of systematized instructional planning in most already established institutions of higher education, with the majority of their faculty members and equipment already committed to more traditional approaches.

Educational media utilization is being approached in a similar but as yet less systematized fashion in medical education at the University of Washington Division of Health Sciences where the following resources are planned to be in use within a short time: (a) MEDLARS medical library automated bibliographic data retrieval system; (b) a library of proramed audiotape cartridges for a self-instruction ystem designed to supplement much of the routine f a teaching laboratory; and (c) programed workooks and slides synchronized with audiotapes to orm the basis for self-instruction units. A Learning Resources Division employing an academic communiations specialist is soon to be established.

The Automated Learning Center of the University of New Mexico seeks to develop effective ways to personalize large-group instruction and to individualize learning generally through programs involving uses of tape-slide materials, the computer, and "live" professors. Three levels of programs will be developed: (a) those for the main continuity — general, (b) those for learners having deficiencies with respect to content, and (c) those for learners who demonstrate a high level of proficiency in mastering content. More than a hundred students at a time, seated in an auditorium especially equipped with four program sources, listen to the audio on earphones and view visuals on one of several screens. Typically, the student's performance is checked by means of machine-scored tests taken during the course of instruction. Test response sheets are designed to permit computers to analyze concepts, skills, and values learned and to assign students to further work in proficiency programs, deficiency programs, special projects, or small-group meetings with professors.

The Multipurpose Electronic Communications Network proposed for Pennsylvania State University represents another unusual and promising application of systems planning to that institution's 19 campuses spread throughout the state. Involved is an interconnecting electronic network that eventually will permit all these campuses to (a) exchange program materials for classroom instruction or continuing education, (b) provide library information retrieval services, (c) offer access to computers for research and training, (d) transmit administrative data, and (e) offer programmatic materials and resources for in-service development of teaching, administrative, and supporting staff members.

EDUCOM (The Interuniversity Communications Council) is committed to the encouragement of joint efforts among colleges and universities to stay abreast of new developments in communication sciences and to apply them most effectively to the teaching-learning, research, and internal management problems of institutions of higher learning. Task forces have been established by this organization to study specific applications of the new technologies to higher education. Among the groups at work on these problems are: (a) Task Force on Information Networks, concerned with development of operating programs using computer systems for information storage, retrieval, and dissemination; (b) Task Force on Educational Systems and Technology, concerned with the broad spectrum of teaching and learning systems, with emphasis on inclusion in such systems of mechanical and electrical communication devices; (c) Task Force on Legal Aspects of Educational Technology, concerned with the broad spectrum of teaching and learning systems, with emphasis on inclusion in such systems of mechanical and electrical communication devices; (d) Task Force on Legal Aspects of Educational Technology, concerned with problems of relationships among authors, publishers, librarians, computer systems operators, network carriers, and scholars; (e) Task Force on Continuing Education, concerned with lifetime learning for professionals in fields such as medicine, nursing, engineering, teaching, and business, as well as in other rapidly changing fields; and (f) Task Force on Computer-Based Systems for Clinical Operations, concerned with the use of computer and telemetry systems in clinical health sciences.

Each of the Task Forces has an interest in basic research in communication involving, for instance, the relative advantages of different modes of communication, limits of human information-processing abilities, channels through which information flows, use of dynamic mathematical models as aids to human thought processes, noncomputational and linguistic uses of computers, and methods of computer search of indexes, abstracts, or full texts.

CASE DESCRIPTIONS

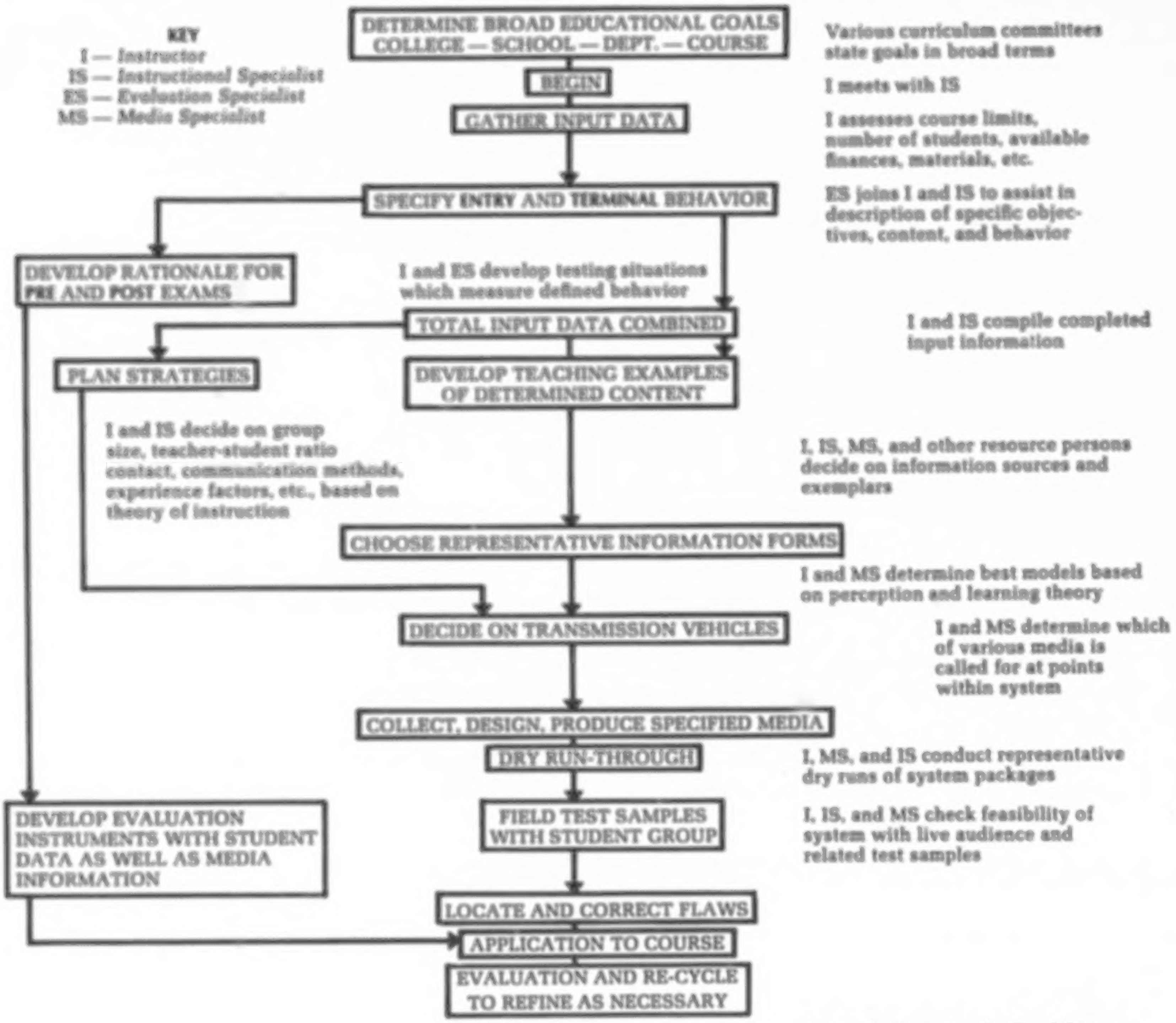
Instructional Systems Development
Michigan State University, East Lansing
John Barson

The Educational Development Program at Michigan State University is charged with the task of facilitating more effective ways of meeting growing instructional demands. These demands frequently result in the use of the newer media of communications. With few models for guidance, the newly formed group has been searching for a viable organizational structure and an accompanying set of operating procedures.

In 1963-65 the University conducted a study titled "A Procedural and Cost Analysis Study of Media in Instructional Systems Development." A major portion of this investigation was given over to the development and field testing of an organization and operation which could serve as a model instructional development system. The development model consists of an organizational scheme which differentiates substantive personnel specialties and the steps of instructional development. The decision sequence and respective information needs were derived in the analysis of actual course development work by faculty members and specialists over a 5-year period. (See flow chart of the hypothetical model on page 122.)

Recognizing the possibilities of further model refinement and dissemination, the findings were incorporated in a new project at four universities. This major demonstration program enlisted the aid of Michigan State University, University of Colorado, San Francisco State College, and Syracuse University. These institutions exhibited a readiness and willing-

A FLOW CHART* OF PROCEDURES FOR ANALYSIS OF INSTRUCTION AND IMPLEMENTATION OF NEWER MEDIA OF COMMUNICATIONS


KEY
I — Instructor
IS — Instructional Specialist
ES — Evaluation Specialist
MS — Media Specialist
DETERMINE BROAD EDUCATIONAL GOALS COLLEGE — SCHOOL — DEPT. — COURSE
Various curriculum committees state goals in broad terms
BEGIN
I meets with IS
GATHER INPUT DATA
I assesses course limits, number of students, available finances, materials, etc.
SPECIFY ENTRY AND TERMINAL BEHAVIOR
ES joins I and IS to assist in description of specific objectives, content, and behavior
DEVELOP RATIONALE FOR PRE AND POST EXAMS
I and ES develop testing situations which measure defined behavior
TOTAL INPUT DATA COMBINED
I and IS compile completed input information
PLAN STRATEGIES
DEVELOP TEACHING EXAMPLES OF DETERMINED CONTENT
I and IS decide on group size, teacher-student ratio contact, communication methods, experience factors, etc., based on theory of instruction
I, IS, MS, and other resource persons decide on information sources and exemplars
CHOOSE REPRESENTATIVE INFORMATION FORMS
I and MS determine best models based on perception and learning theory
DECIDE ON TRANSMISSION VEHICLES
I and MS determine which of various media is called for at points within system
COLLECT, DESIGN, PRODUCE SPECIFIED MEDIA
DRY RUN-THROUGH
I, MS, and IS conduct representative dry runs of system packages
DEVELOP EVALUATION INSTRUMENTS WITH STUDENT DATA AS WELL AS MEDIA INFORMATION
FIELD TEST SAMPLES WITH STUDENT GROUP
I, IS, and MS check feasibility of system with live audience and related test samples
LOCATE AND CORRECT FLAWS
APPLICATION TO COURSE
EVALUATION AND RE-CYCLE TO REFINE AS NECESSARY

*Note: Information feedback loops have been deleted from this illustration.

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ness to move into full-scale instructional planning and had expressed a need for an organizational structure and accompanying operating procedures — a development system. By incorporating the instructional development procedures evolved in the original procedural and cost analysis study, these schools not only served as working models for instructional systems development in their area, but also fed back data as to the feasibility and reliability of the trial system. The three tasks of this study were to evaluate the proposed system by assessing its strengths and weaknesses within differing institutional settings; to disseminate this model of a development system in such a way that the probability of trial and adoption would be relatively high; and to evaluate the demonstration form of dissemination.

The final product is a summary document which (a) describes the major steps taken by the demonstration institutions in implementing a systematic approach to instructional planning; (b) contains an improved form of the development system; (c) includes diffusion data; (d) offers a prescription for the curriculums of substantive degree programs for system development specialists; and (e) presents comparative cost data for instructional systems development.

The project offered instructional development assistance to faculty members in selected courses at the four institutions. This aid was provided by a three-man team, consisting of an instructional specialist, a media specialist, and an evaluation specialist. The courses had to enroll a minimum of 500 students per year. The work of these development groups was recorded on audiotape and sent to the Project Coordination Office at Michigan State University. After transcription, the development activities were reviewed by project evaluators, who weighed the implications of actual events versus the proposed steps in the model. In addition to development work, various dissemination activities were conducted by the four demonstration institutions. Guidance was obtained from the project advisory committee, consisting of persons with long experience in the field of instructional development, and from periodic project review meetings of the investigators.

Instructional Systems Approach

Oakland Community College, Bloomfield Hills, Michigan

Albert A. Canfield

The Oakland Community College instructional model emphasizes self-study and programed instructional sequences in an environment where the learner may obtain help or clarification from a tutor. The self-instruction takes place in a learning laboratory, characterized by carrels. Media of different forms and types are always available. Tutors are available to help learners at any time. Students may study different courses under different tutors at the same time.

The instructional systems approach begins with the job and task analysis of those assignments and situations with which the student must cope. This analysis will provide much of the information needed to describe instructional and learning objectives in precise behavioral terms. Without such behaviorally verifiable objectives, neither the learner nor the institution has an opportunity to assess and subsequently improve the instructional procedure. Many instructional objectives are difficult to define in behavioral terms and hence to measure. The instructional systems approach provides specific objectives that can be confirmed by learner and instructor alike. The instructor devises sequences for the learner which will provide the most economical and meaningful learning. In selection of content and media for this instructional sequence, the faculty at Oakland Community College are likely to play a role quite different from the conventional role.

The same techniques (developing learner involvement and providing feedback) can be applied to a whole sequence of learning experiences. A series of different media contacts or experiences (just like a series of frames) represents a program of study. Major characteristics of successful programs are the same principles one would deduce from our knowledge of human learning. The frames, or bits of experiences, are kept small. The learner is given hints and review materials to assist in the determination of the correct responses. Reinforcing stimuli are applied quickly after the learner's response to provide positive reinforcement. The learner is led through a series of stimulus-response situations in which success is probable and reinforcement is positive and frequent.

The sum total of these two emphases — systems approach and the principles of programing — has produced an instructional model which borrows from both.

Recognizing affective needs of students and the role of the human in motivation and explanation — not to say faculty needs to hear themselves teaching — the model also incorporates weekly assembly sessions where students hear major presentations, take examinations, etc. For course areas which demand the integration of material or where discussion and adjustment to changing personal/social climates are important, small-group discussions or conferences are arranged. These small-group sessions include from five to eight students and may occur without the supervision of an instructor, depending on the objectives of the program element.

The key to implementation of the approach is provision for frequent feedback of student performance. The learner needs such information to modify his approach, his habits, his views. The faculty needs such data to modify and improve the instructional program.

An energetic and devoted faculty has written the specifications for approximately 120 programed books in a wide variety of fields, and nearly 250 Community College courses have been written and revised — at least once — for use with the instructional systems approach.

The similarity between elements of the systems model and the College's emphasis on objectives, instructional routines, and utilization of feedback gives an accurate, if complex, view of the basic instructional approach itself. Oakland Community College views the term *system* as meaning an operational procedure that embraces a number of different elements operating in combination to produce some specific definable goal — maximizing those elements through system analysis and feedback information, and the refinement of an interdependent and correlated complex which achieves its objectives with maximum efficiency and at least cost.

Instructional Systems for Teaching and Learning

Southern Connecticut State College, New Haven

Hilton C. Buley

Engleman Hall at Southern Connecticut provides an advanced organization of instructional media for the improvement of education. The structure incorporates some of the most advanced instructional systems to be found anywhere in the United States, such as the multimedia presentation system in the lecture hall.

At the top of the building, a large antenna installation denotes an extensive closed- or open-circuit TV system which can be used from a variety of stations.

The building includes psychology, optics, and sound laboratories; central test areas; experimental classrooms with one-way vision screens for observation by teachers; laboratories for animal and psychological experiments; computers; language laboratories with banks of tapes in many subjects; and other facilities seldom found in the school or college classroom.

In the current welter of discussion about the quality and quantity of education in America one fact is crystal clear. The college population is burgeoning, and the physical facilities and academic faculties to meet this population explosion must grow proportionately. The disturbing question is: Will our colleges and universities be prepared to take care of this need?

In Engleman Hall, Southern Connecticut State College educators think they have found at least one answer. By using electronics as a pedagogical tool, two significant things are possible:

1. A college professor can reach a larger number of students in a classroom or laboratory situation on both a lecture and individual basis.
2. A student, through the aid of closed-circuit television, can observe typical classroom situations involving children, can analyze motivation and behavior, and can have his questions answered on the spot without disturbing or affecting the children under observation.

The fundamental purpose of these modern up-to-date instructional facilities is the improvement of the teaching and learning process. This is how SCSC plans to provide an ever-higher quality of education for a rapidly expanding college-age population with continually greater efficiency and economy. Through utilization of modern tools and techniques of teaching, it is possible to extend effectively the influence and expertness of the faculty to accomplish their goals without a proportional increase of physical plant investment.

Eventually the entire SCSC campus will be hooked up to lecture halls and conference rooms so that a laboratory experiment, a lecture, dramatic presentation, musical offering, or language lesson can be studied in many places. Using videotape recorders and a mobile panel, equipment can be sent anywhere in the state to gather resource materials. The microwave relay facilities will enable SCSC to provide courses for the general public by means of closed- or open-circuit television and to tie in with other educational institutions.

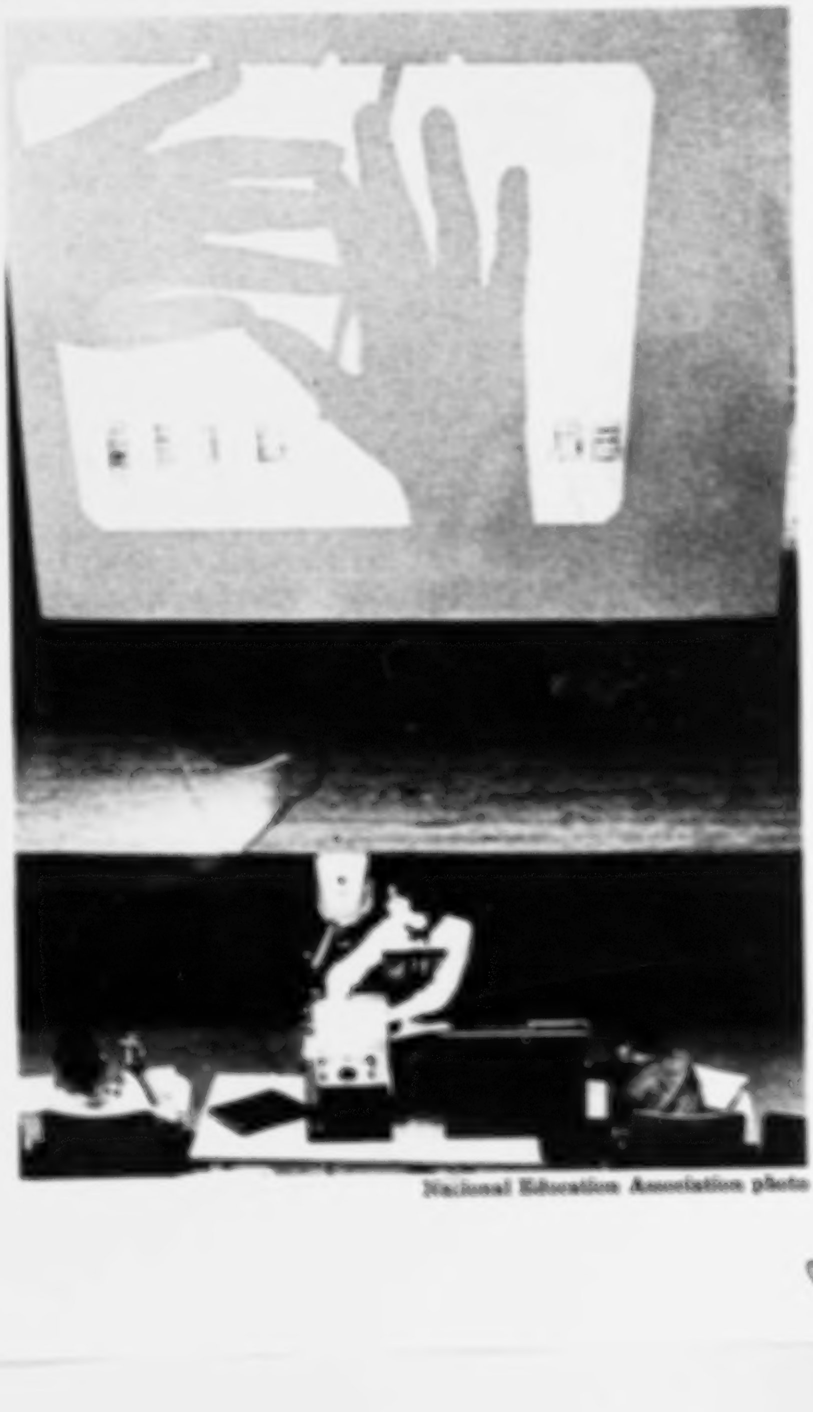
Engleman Hall also is a research center. New ideas in education can be tested and evaluated. New methods of teaching and learning can be studied for future exploration. School executives and teachers can see the latest electronic devices for teaching and testing; the newest books and curricular materials; laboratories in languages, education, and the social sciences; audiovisual techniques that were scarcely dreamed of 5 years ago; and methods of inducing students to progress as rapidly as possible at their own rates of speed.

The basic purpose of the SCSC instructional systems approach is to increase efficiency of instruction. This can be done by utilizing modern tools of teaching, by incorporating a greater amount of independent study on the part of students so they take on a greater amount of responsibility for their own education, and by imposing more severe demands on the faculty than in conventional college instruction. The professor must organize and program his material well in advance and move skillfully. In addition, the new equipment emphasizes team teaching and cuts across traditional academic disciplines.

A Multimedia Independent Study Laboratory

State University of New York, College at Fredonia
Robert M. Diamond

In the fall of 1968 the State University of New York at Fredonia will open its new communication-lecture hall facility. Located within this building will be — in addition to lecture halls, technical and graphics areas, television, and radio — an independent study laboratory. In an effort to design a space that would permit maximum flexibility of use with a minimum expenditure for hardware, the Instructional Resources Center opened, in the fall of 1966, a multimedia independent study laboratory to serve as an experimental proto-



National Education Association photo

type for the 45-student-station laboratory proposed for the new building. In this laboratory, an attempt has been made to answer several specific questions:

1. What type of carrel design or designs would provide for maximum effectiveness and efficiency?
2. What types of learning sequences belong in a central laboratory, and which, logically, could be located within the specialized buildings on the campus?
3. Would a laboratory such as this be utilized by faculty?
4. Could an independent study laboratory serve a wide variety of needs without involving a major expenditure for support hardware?

To provide maximum capabilities, the laboratory now uses three types of carrels:

1. *The multimedia carrel* — single-sequence carrels which utilize a programed booklet in conjunction with an 8mm cartridge film or slide projector. For these stations a projector mount has been designed which permits the use of projected materials while requiring a minimum of additional carrel space. When required, an audio capability can be added. Since certain sequences require more space than others, these stations have been built in three basic sizes.
2. *The tape carrel* — at present, a standard listening and record station. A cartridge unit, ideal for a student checkout procedure, is being explored for these stations.
3. *The multipurpose nonequipment carrel* — designed for use with book-based programed sequences that may or may not combine the written sequence with associated materials.

During the fall semester of 1966, a total of 1,586 student sequences were completed in the 14-station laboratory. Success of this approach was indicated by an increase in the second semester of operation with 437 student sequences completed in the first three weeks of the term.

Seven stations involved with instructional media (one each on the operation and use of the tape recorder, overhead projector, slide projector, filmstrip projector, heat and handmade transparency production, lettering techniques, and mounting techniques) are in the laboratory. Three more stations in this area will be added with the availability of equipment — the 16mm projector, the record player, and Diazo production. The media sequences utilize a programed booklet in conjunction with a variety of materials. Several use short 8mm films; the tape recorder utilizes a programed tape; the record player and 16mm projector sequences use a filmstrip series.

Each station is programed independently of the others, thus providing maximum flexibility. Required of all elementary education majors, these sequences are being used increasingly by students in speech and hearing and secondary education. Individual sequences were field tested and analyzed for pacing, usefulness, and content: 92 percent found the overall program to be good or excellent, with 97 percent stating that the sequences were proving helpful in their student teaching. A vast majority of the students stated that they would like to have more sequences made available.

A total of 23 programed remedial sequences are also being utilized in English composition. When specific weaknesses are identified by instructors, students are assigned the particular sequence dealing with this area. Assignments usually take from 15 to 30 minutes. In the first three weeks of the second semester, 120 assignments were made in freshman composition. The sequences being used are portions of four programs commercially available: *English 3200*, *Proper Punctuation*, *Effective Writing*, and *Spelling Improvement*.

Other programed sequences now available in the laboratory include one on slide rule operation, a series of short remedial sequences in biochemistry, and a sequence in crystallography.

Listening stations are being used in music, English, and foreign languages; additional listening assignments now are being developed for social sciences and education. Shortly, testing will begin on two multimedia programed sequences in music. Tapes used in the carrels come from various local and commercial sources.

While the majority of the stations are located in the central laboratory, multimedia carrels also are designed for use in two specialized areas — music and science. Music carrels will be utilized for a variety of programs including instrument repair and maintenance and internal training. Science carrels are placed in a laboratory where an entire laboratory sequence is programed. In both instances, the number of stations required and the need for specialized equipment, combined with the requirement that stations be located in areas central to the particular students for which they were designed, justify this decentralization. The use of carrels within the dormitories of the campus also is being explored.

The Fredonia carrel station is quite inexpensive. The most complex multimedia carrel has for basic equipment a projector and the underslung screen unit (built locally on the campus). Total cost for both units is less than $200. Many stations require nothing more than a programed book and associated materials.

Instructional Development

Syracuse University, Syracuse, New York
Don Ely and DeLayne R. Hudspeth

Instructional development activity at Syracuse University represents a systematic attempt to use creatively the new educational technology. This thrust is seen as essential if the University is to handle spiraling instructional costs and a greater demand by students for improved instruction.

There are two assumptions in instructional development. The first is that there must be a primary technology, including hardware, software, and the people to operate the audiovisual services required for modern instructional activity. The second assumption is that education in a university atmosphere involves considerably more autonomy than in other educational sectors of our society such as industry, government, and the public schools. While this autonomy provides some roadblocks to an efficient educational system, it also allows for growth that is not possible under more constrained circumstances.

Present instructional development activities are seen as a continuum ranging from individual instructor improvement through systematically developed learning sequences. In individual instructor improvement the efforts of the instructional development team are simply to improve the capabilities of the individual instructor, whatever techniques he may use, in whatever circumstances he finds himself. The difference between this activity and the historical development of the audiovisual field rests in more sophisticated inputs such as content design and evaluation assistance.

In systematically developed learning sequences, an attempt is made to focus on the multidisciplinary inputs which can be brought to bear to improve the instructional environment for the student. This usually involves a team of at least four people: a learning specialist who can look at the learning patterns of students and recognize roadblocks; a media specialist who can aid in designing message systems of greatest impact; an evaluation expert who can draw out of the instructional materials those items or situations which demand behavioral change on the part of the student representing learning; and the content specialist who provides the goals and substantive information.

Considerable attention is being given to two facets of the instructional development process. The first of these is an attempt to analyze the nature of an interdisciplinary team as represented in systematically developed learning sequences, so that the effective interaction of this group can be maximized. What are the characteristics of team members who can maximally work together in an instructional problem-solving situation? What kind of environment is necessary for this team to produce as efficiently as possible? And what are the essential primary technology components needed for this system to work?

The second aspect of instructional development is cost. Cost *qua* cost is not the major consideration. The problem of cost/effectiveness yields a utility factor which is the major consideration. It is, at the present time, the most difficult to determine. It must, in the long run, be answered if instructional technology is to continue in the takeoff stage.

Articulated Instructional Media Program

University of Wisconsin Extension Division, Madison

Eldon J. Ullmer

The Articulated Instructional Media (AIM) program of the University of Wisconsin is intended to meet one of the most pressing problems facing modern education: that of reaching those persons who, for reasons of time or money, cannot attend a college campus on a day-to-day basis. The particular goals of the program are to (a) reduce growing pressure of campus population on on-campus institutions; (b) reach the off-campus population; (c) allow faculty members more time for research and individual student help; (d) make courses more readily available to students any time and any place; and (e) provide superior instruction incorporating feedback to the course instructor.

The AIM program selects and combines the best features of the resident instruction program, the conference or institute method, correspondence instruction, radio and television, and programed instruction. The use, combination, and application of these various methods and media is what is meant by the term *articulated instruction.*

Because an AIM student performs most of the instructional tasks at home, there are obvious limitations to the types and cost of media that can be employed. Expensive and complex media systems must be avoided, so maximum effort is devoted to designing instruction that will effectively establish the desired learning outcomes through the use of relatively simple and familiar media.

One device receiving wide usage is the tape recorder. Lectures are taped, in either the classroom or a studio, and duplicate copies are sent to all students enrolled in the course for permanent use. This approach gives the student the opportunity to review lectures and also allows the instructor to improve his presentations through self-analysis and editing.

Filmstrips and 35mm slides are used when presentation of visual stimuli is required. Sometimes both audio and visual media are combined in a synchronized presentation. For example, one instructor in the University nursing school has found this type of presentation very effective in teaching such manipulative skills as the making and changing of hospital beds.

When motion becomes a vital feature of a presentation, 8mm loop films can be employed in sound or silent versions. A German professor at the University of Wisconsin at Milwaukee is utilizing the sound motion picture projector in his conversational German course to show the various lip and tongue positions involved in pronouncing German vowels and consonants.

The programed text is another valuable tool for articulated instruction, especially if tight stimulus-response control is desired. In this concept, large blocks of information are broken down into easy stimulus-response units so that the student can progress at his own rate from one concept to another. This technique has been successfully employed in an introductory sociology course within the AIM program.

The programed notebook is another instructional device used in AIM courses in conjunction with lectures or text. The student can turn to the notebook to solve problems or draw diagrams based on lecture or ext material. The notebooks are structured according o principles of behavioral technology to facilitate evelopment of proper student behavior.

The use of overlay booklets has proved valuable in resentation of intricate visual material. This has ound a useful application in an engineering graphics ourse developed by the Engineering Department of he University.

A professor in the Physics Department has developed a portable laboratory kit that allows students to erform experiments in basic physics in their own omes. Thus, the introductory course in physics can e offered to AIM students for five credits as it is iven on campus.

Radio also plays an important part in the AIM program. In some courses, lectures are aired over the state educational network. Students also can receive taped copies for review or in case the broadcast lecture is missed. Students who wish to record questions or comments with instructors located on campus can avail themselves of a telephone recording service which functions in the evening hours.

All the media used in AIM courses are utilized in accordance with certain developmental principles. These include determination of course objectives in terms of student performance; use of field testing during development to provide an indicator of the effectiveness of materials; active student participation through use of programed materials and manipulative devices; use of frequent quizzes to provide feedback to the student; student self-testing; and self-pacing on the part of the learner in accordance with his ability.

Future plans for the AIM program include continuous expansion of the number of courses to be offered and further increases in the number of students to be served.

Teaching Information Processing System
University of Wisconsin, Madison
Allen C. Kelley

TIPS, a Teaching Information Processing System, is designed to gather information from students in the Department of Economics on mark sensory or optical scanning forms and to process this information, thus providing the student, teaching assistant, professor, and administrator with output which enables more effective instruction and planning.

To date (1967) a significant portion of the initial development has been completed. Additionally, a pilot project with over 800 participating students is in its final stages. As part of the pilot project, 5-minute surveys (multiple-choice or true-false questions) of student performance are administered weekly in a large lecture session. The student responses are processed, and, within 24 hours, outputs are available for distribution to the students, graduate teaching assistants, and professor.

The student obtains a report which presents an analysis of his individual performance on the survey questions. Based on the individual student results, problem sets and readings are assigned. Thus, in a given group and on a given date, there may be several quite different types of assignments for the class. Additionally when a student does consistently poorly over several weeks, he is given instructions to make an appointment with the professor or teaching assistant in order to discuss his weaknesses and perhaps to initiate a special study program or tutorial. For the student doing particularly well, assignments and/or examinations may be made optional, and term papers may be assigned. In general, through the student report form framework, a level of individualized instruction can be obtained which is largely invariant to the size of the particular class.

Professors and teaching assistants receive a detailed analysis of student performance. The analysis is presented for each question, for each concept, and for the entire survey. The teaching assistant employs this information to develop materials for his sections. While a given teaching assistant may thus have a large number of sections, it is possible, with TIPS, to offer instruction which matches the objectively identified needs of each group. Furthermore, the teaching assistant is able to identify early those students having difficulty.

As the system is presently formulated the main focus has been to obtain information from the student which is relevant to effective instruction, and to process and act on this information in a timely manner. These data are not used for grading purposes, nor are they used to evaluate graduate teaching assistants. As TIPS is being developed for the future, several directions for increased capability are being explored:

1. A test analysis system will be provided. This system not only will correct and tabulate student tests, but also will aid in formulating student grades (e.g., standardization of test scores among parts of an examination, or among examinations), will provide each student with an analysis of his responses on examinations (including suggested readings and aids to strengthen areas where the student appears deficient), and will analyze for the teaching assistant and the professor the results of the test by question and by concept.

2. A general research analysis system will be constructed. This capability will provide a wide array of statistical devices for analysis of both survey and test results, including regression analysis, plotting routines, cross-tabulation, and so forth.

3. A system which facilitates direct classroom experimentation with the computer for instructional purposes will be prepared. Classroom experiments in economics, for example, could include a wide array of topics, from macromodel simulation to elementary supply and demand analysis.

During 1967 these remaining portions of TIPS will be specified and implemented on selected classes. This phase of the research project includes a detailed evaluation of the pilot project, development of manuals and materials necessary for the implementation of TIPS, as described above, and establishment of priorities for the future development of TIPS in its application of modern technology to higher education. While TIPS has been developed as an ongoing research effort by an economist and implemented in classes in a department of economics, it is clearly very general in its scope and applicability.

INSTITUTIONAL INVENTORY

Connecticut College, New London. Connecticut College Library is associated by teletype with 10 other libraries in the state. Uses system in obtaining interlibrary loans, photoduplicated materials, and location of references. (Hazel A. Johnson)

Eastern New Mexico University, Portales. Purpose of this institution's Automated Learning Center is to produce teacher programmable machines and programing theory to promote individualization of learning at the classroom level. More than 600 tape-slide programs for instruction in elementary through graduate school have been produced since the Center started in 1964. The Center also uses IBM 360 computer terminal for learner assessment in 1967. Three types of programs are being developed experimentally in educational psychology for (a) learners with deficiencies, (b) learners with proficiencies, and (c) learners making average progress. Machine-scored tests provide the basis for recommending which of the programs the individual should follow at any period of his instruction. (Herbert E. Humbert)

EDUCOM. Interuniversity Communications Council unites institutions all over the country to exchange information about and to study problems of the applications of communication sciences to higher education. (Contact address: Edison Montgomery, University of Pittsburgh, Pittsburgh, Pa.)

Florida Atlantic University, Boca Raton. Division of Learning Resources provides local services for TV, slide, or film productions for systematic uses in University courses. Faculty members originate ideas for productions; discuss ideas informally with Learning Resources personnel; initiate formal requests through

channels, after which production schedule is developed. Evaluation of production and revisions (if necessary) follows regular classroom use. (Harvey K. Meyer)

Los Angeles Valley College, Van Nuys, Calif. Released time provided for some instructors to study systems approaches to teaching American history. (Kermit Dale)

Michigan State University, East Lansing. Procedural and cost analysis, experimental and developmental in nature, involving systems approach to problems of instruction in Michigan State University, University of Colorado, San Francisco State College, and Syracuse University. Supported as a U.S. Office of Education Title VII-B, NDEA, contract. (John Barson)

Oakland Community College, Bloomfield Hills, Mich. Employs broad systems approach to most of its curriculum. Described as a plan that contains "specifically defined objectives, detailed plans for their achievement, identification of all crucial elements and their inter-reactions, and continued feedback." Considerable emphasis on audiotapes, visual displays, books, periodicals, experimental laboratory setups, and programed materials. Patterned to great extent on model developed by Postlethwait, Purdue University. (Albert A. Canfield)

Pennsylvania State University, University Park. Planning a Multipurpose Electronic Communications Network which, when complete, will interconnect 19 campuses throughout the state to provide the following services: exchange of program materials for regular classroom instruction or for continuing education, library information retrieval systems, access to computers for research and training, transmission of administrative data, in-service training, and systems design. (Leslie P. Greenhill)

Southern Connecticut State College, New Haven. Incorporates on its campus some of the most advanced instructional systems, including a multimedia presentation system in the Lecture Hall. Extensive closed- and open-circuit TV system, optics and sound laboratories, central test areas, experimental classrooms with one-way vision screens, science laboratories, language laboratories. Future plans involve hooking up the entire campus to the Hall; mobile units to be used to send equipment anywhere in the state; microwave relay facilities to be used to provide courses for the general public. (Hilton C. Buley)

State University of New York (SUNY), College at Fredonia. Communication-lecture hall facility to be opened fall 1968. A multimedia independent study laboratory was opened in the Instructional Resources Center in fall 1966 as an experimental prototype for the 45-student laboratory proposed for the new building. Questions on carrel design, types of learning sequences, utilization, expenditure have been studied. The study laboratory has been judged successful; stations are inexpensive and flexible; student and faculty attitudes positive; use expanding. (Robert M. Diamond)

Syracuse University, Syracuse, N.Y. The Center for Instructional Communication maintains a supportive service for the faculty of the 19 schools and colleges of Syracuse University. This service includes media and materials in the areas of audio recordings, graphics, photography, motion picture productions, film distribution, and equipment. Continuing effort is made to foster improved utilization in college teaching. (Don Ely and DeLayne R. Hudspeth)

System Development Corporation, Santa Monica, Calif. SDC has been awarded a contract by Gallaudet College to perform an analysis of its present and projected 10-year requirements for applications of educational technology planning for computer-related instruction, learning, and research; student records and counseling; administrative data processing; and computer-independent devices and methods, such as videotapes, films, filmed captioning devices, and special laboratory linguistic analysis.

University of California at San Diego. Employs student response systems, programing video recording, and advanced uses of other audiovisual materials in systematic fashion in effort to individualize instruction. Multidisciplinary laboratories (designed as lecture laboratories) contain individual cubicles and shared laboratory benches; multigroup TV presentations viewed in these areas precede actual applications of procedures demonstrated. (Charles F. Bridgman)

University of Washington, Seattle. School of Medicine reports plans for increasing stress on conjoint and system-oriented teaching and favorable faculty opinion toward employment of some automated media for routine instruction in order to release students for more electives, earlier selection of specialties, and more personal contacts with professors, patients, and clinics. MEDLARS library retrieval system in use for bibliographic information. (Boyd F. Baldwin)

University of Wisconsin, Madison. TIPS, a Teaching Information Processing System, is designed to gather information from students on mark sensory or optical scanning forms, process the information, and provide student, teaching assistant, professor, and administrator with output which enables more effective instruction and planning. AIM, the Articulated Instructional Media program, is an attempt to help highly motivated adults obtain a college education with maximum emphasis on independent study approach and minimum attendance at University classes. It employs taped radio lectures, telephones to speak to instructors, programed manuals to be used with taped lectures, a microviewer, and commercially prepared filmstrips. Program, in transition, ranges from traditional approaches to exciting new attempts at improved instruction. (Eldon J. Ullmer and Allen C. Kelley)

U.S. Naval Academy, Annapolis, Md. Proposes to develop 4 multimedia programed courses of instruction. The courses to be provided will employ a variety of educational media, including computer-assisted instruction. The objective will be to develop "best possible" instructional media, materials, and strategies.

SUMMARY

The systems technique, originally developed in industry, is finding increasing application to the revitalization of curriculum and instruction in higher education. The examples reported to the Higher Education Media Study indicate that institutions are applying the technique to individual courses, as at the University of Wisconsin; in the planning and construction of facilities, as at State University of New York at Fredonia; and to the creation of completely new instructional patterns, as at Oakland Community College.

In essence, the systems approach involves an operational plan combining a number of different elements — professor, student, instructional materials, facilities and equipment, and specialized personnel — to produce, to evaluate, and to revise instructional activities in order to achieve specific and definable goals. Stating behavioral objectives, planning the orchestration of assets of all kinds, presenting the subject matter, achieving feedback by tests and by informal means, and replanning are the basic steps in the systems approach to both course planning and development.

XIV

MANAGEMENT OF MEDIA SERVICES

LOGISTICAL problems associated with physical facilities, technical assistance, and budgeted funds for new media services appear to have been worked out satisfactorily on many college campuses. Still, the most crucial administrative problems await resolution. Increasing interest of higher education administrators (sparked, no doubt, by problems associated with increasing numbers of students and federal matching programs for new media and equipment) finds many campus media administrative organizations at a relatively primitive level of development.

A good deal of credit must be given to past efforts of campus media directors whose points of view may be summarized, although admittedly oversimplified, by one junior college director who said: "The instructors simply ask for whatever medium or equipment they want, and we do our very best to provide it immediately." It is this same point of view that seems to be reflected, also, in one institution's basic objectives for media services: (1) to inform the campus of services available, (2) to instruct students and faculty in the utilization and operation of audiovisual equipment, (3) to supply equipment and materials to instructors on request, (4) to produce visual materials for class use, and (5) to provide assistance and consultation to faculty members who desire to restructure their courses to improve instruction.

But, laudable as such points of view or service objectives have been, they cannot be interpreted as fully reflecting today's needs with respect to higher education new media services. It is no longer enough to assume the somewhat passive "service" role assigned to them in the past; if technology is to contribute its full potential to improvement of college teaching, its exploitation must be integrally related to the full process of instructional *planning*. And such planning should result in the *design* of instructional experiences and in the administration of systematically supportive instructional services that take into account the interrelatedness of clearly defined instructional goals, and techniques to accomplish them, as described earlier in Chapter 13, "Systems." The truth of the matter is that in altogether too few cases do college and university media services directors play significant roles in analyzing goals and designing strategies to attain them.

In addition to insights derived from several institutional reports that deal with organizational plans and policies for new media services, a few suggestions are offered by the HEMS staff, based largely on experience and conversations on various campuses about these matters. Several rather clearly defined administrative steps seem essential in any institution that desires to encourage expanded and improved use of new media as a part of its drive toward excellent instruction:

- The head of the audiovisual services or instructional resources should be a professional member of the faculty who merits respect and acceptance from the rest of the faculty. Competent and well-meaning though he may be, the young technician who is seen by the faculty as simply a distributor of materials and repairer of equipment will have a difficult time promoting innovation.
- The faculty director of instructional resources ordinarily should report directly to the institution's chief academic officer, rather than to the dean of any of the schools of a university.
- The director of instructional resources should be oriented primarily toward the improvement of college teaching rather than to the mere management of media facilities. He should have general competence in matters pertaining to curriculum improvement, and

he should be skilled in working with those of the faculty who are interested in improving their teaching.

- There is merit in providing the division of instructional resources with its own budget, so that its services may be provided to the faculty member without charge-back of costs to the department. In a department with a limited budget, it may happen that the low-ranking young professor is the most eager to use the service to improve his instruction, but is also the last one to have his request approved for departmental funds. The divisional budget also is a sign that the top administration recognizes and supports the services of instructional resources; it adds status to this comparative newcomer to the scene of higher education.
- Preferably, the media center's services should be limited to those who are members of the institution's staff. An off-campus film rental library, at one time so common in university extension divisions, should not be allowed to drain off the energies and interests of media personnel that ought to be directed toward the improvement of on-campus teaching.
- Discipline-oriented consultants, who are interested in the instructional potential of the new media, ought to be assigned also to the staff of the instructional services division. Such a consultant, at the request of a faculty member, would attend several sessions of his classes and thereafter work with him in clarifying his instructional objectives and in searching for ways in which they might be better achieved through the use of new media.*
- A convenient and attractive space for the division of instructional services is very important in encouraging faculty acceptance and utilization of these services.

At several of the institutions visited, new media services were housed in basements of the oldest buildings on campus, or in "temporary" buildings dating from decades ago. On the other hand, the highest morale of staff as well as the more imaginative uses were discovered more frequently on those campuses where unified services were housed either in the library (or "Learning Resources Center") or in connection with one of the special facilities that made extensive use of new media.

In colleges that provide adequate administrative and budgetary support for improvement of teaching, there is likely to be at least one area in which several related media functions are housed. Thus, a single building may include self-instructional space and learning programs, films, slides, recordings, tapes, maps, charts and diagrams; audiovisual equipment and services for all campus classrooms; facilities for storage, maintenance, and repair of this equipment; photographic services, including microphotography, aerial photography, and film and print processing; graphic arts services; and consultative service in planning new physical facilities to provide for all such new media utilization.

Another kind of special facility for media services is sometimes found in the form of specially designed and equipped classroom buildings in which a variety of new media techniques are employed. In effect, this facility might be described as a building made up of several multimedia rooms as discussed earlier in this critique. One junior college is constructing such a media services complex containing 12,500 square feet and providing facilities for producing slides, films, closed-circuit television, videotapes and audiotapes, and self-instructional programs. This building will provide nine separate video lines, so that different programs may be sent to classrooms simultaneously. In addition, seven rear projection multimedia rooms of different student capacities are available in the building.

The campus visits and the written reports furnished HEMS indicate a very lively interest in colleges and universities, large and small, in improving instruction by means of convenient access by instructors and students to new media. The specific plans to provide the required services vary greatly from campus to campus, as they should; each institution seeks to provide services for its own campus to meet its own needs within the limits of its own resources. Because of the diversity of needs and resources, it seems to be both impossible and unwise to try to recommend any special facility as a model for other institutions, or as the final answer to effective utilization of new media. Rather, the criteria should include (a) evidence of careful analysis of probable uses of the facility and of adaptation of the building and the proposed equipment to those uses; and (b) evidence of forethought in providing so far as possible for future expansions and adaptations.

CASE DESCRIPTIONS

Educational Services, an All-College and All-Media Approach

Brevard Junior College, Cocoa, Florida
William K. Cumming

Brevard Junior College is a stone's throw from Cape Kennedy, the technological center of the world. The College is therefore appropriately committed to utilization of all technological developments which can be shown to be of value to higher education.

The instructional program is based on a study of creative innovation through educational technology. The first phase of the study consisted of a re-examination of all operational areas around the campus related to the use of technology, and these were then brought together to provide a single integrated administrative unit.

In 1964 the Television and Radio division, the Audiovisual Resources division, and the Language

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* In the whole field of administration of new media, this may be the area of greatest future potential; the HEMS staff observed again and again that the facilities were available but inadequately used, mostly because faculty members did not feel at ease with them and did not know how to go about applying them to their instructional problems.

Laboratory were coordinated under one administrator. In 1965 the Library was added to these. Then, in 1966, the Institutional Research division, the Study Skills Clinic, and the Data Processing and Technical Research division were included. At the same time, a director of educational services was named and made responsible directly to the president.

The Educational Services Office now includes all of the professional service divisions which directly support the total work of the administration, faculty, and students. It consists of those areas which rely on new technology, have common operating procedures and problems, and provide basic services to the whole College.

This pioneering development was designed from the outset to strengthen and enrich the growth and progress of the institution. The seven closely interrelated units of Educational Services are areas which are concerned with the origination, acquisition, storage, and distribution of pertinent knowledge and information. Their activities center increasingly around the rapid new developments in educational and communication technology. Their responsibilities may be broadly summarized as follows:

1. *Institutional Research* searches for available information to help solve a problem, runs surveys to elicit new information, and provides the results in organized fashion for use in making more valid decisions.
2. *Data Processing and Technical Research* receives information from various sources and processes it to produce reports and summaries of value to specific groups.
3. *The Library* selects and acquires recorded knowledge, catalogs it, makes it readily available for retrieval, or retrieves it and circulates it.
4. *Television and Radio* brings together related display methods in new ways, records presentations, and distributes them.
5. *Audiovisual Resources* selects and acquires recorded knowledge, originates and stores information, catalogs information, and distributes it by a variety of equipment and exhibit methods.
6. *The Study Skills Clinic* evaluates individuals' learning skills needs, provides specialized individual study presentation methods to help meet these needs, and evaluates progress.
7. *The Language Laboratory* acquires recorded knowledge, originates information materials, provides class and individual study presentation methods, and evaluates progress.

The descriptions give clues as to how these areas are interrelated and must naturally work together in the interests of effective and efficient service.

Educational Services at Brevard is intended to provide a working backdrop for continuous self-study and evaluation. Its ongoing work provides the specific information needed to support intelligent administrative and instructional decisions. Its program also broadens the entire instructional process to make possible considerably more attention to learning procedures which can be individualized for each student.

The rapid expansion of Educational Services on the Brevard campus indicates the need for added facilities in the very near future. The Library and Audiovisual Resources are already located in a new Learning Center. A proposed Data Processing Center would provide the needed structure for expansion of the IBM 360 facilities now in use.

A proposed Communications Center will include more suitable areas than are now available for Television and Radio and the Study Skills Clinic. This center will provide adequate TV and photographic studios, areas for individualized study spaces and for data machines, including computer instructional terminals, and for classrooms and seminar rooms supplied with programed presentation methods.

As a part of the Educational Services program, a group of inquiry modules — specialized booths for self-study — have been originated and installed at Brevard. These modules are intended as the first step in providing students, right at their fingertips, with access to every kind of knowledge resource.

The first phase of the modules, completed in 1967, allows the student to dial videotapes, films, live closed-circuit telecasts, and up to 10 commercial and educational TV channels. They will provide access to stereo tapes; language skills tapes; and tapes of test questions, guest authorities, and classroom lectures.

In the modules, also, the learner may watch color movie presentations, study microfilm, use controlled reading scanners, or simply study printed materials.

The Educational Services TV studio utilizes a combination of functions that allow instructor control, director control, or any combination of each within a single program. Its Study Skills Clinic utilizes teaching machines, programed materials, reading machines, random access, and a computer terminal.

In summary, the overall function of Educational Services at Brevard Junior College is not only integration of media; it is innovation in education. Its purpose is to pioneer new approaches to learning processes, to coordinate all interrelated professional resources, to evaluate and introduce new technology, and to improve and revitalize services to the entire College.

The Center for Independent Study
California State College at Hayward

John D. Hancock

The Center for Independent Study at California State College at Hayward, established in the fall of 1963, provides a distribution point for issuing self-study materials, a study area where students may use these materials, and a location for tutorial help. Programed instruction in book and machine format, tapes, loop films, desk calculators, and cartridge films are available for student use.

Primarily, the Center serves as a laboratory adjunct for existing courses. Students are assigned to the

Center for the completion of certain tasks just as they are sent to the library or to the chemistry laboratory. In addition, students who wish to pursue a subject for personal reasons may use the facilities of the Center. Such subjects vary from brief enrichment topics to complete programed courses needed as prerequisites for other college courses. A reading improvement program utilizing several machines is a popular choice. English for the Foreign Born is elected by many of the College's foreign students. At any given time, approximately 10 percent of the student body is enrolled in the Center for Independent Study.

The staff of the Center includes one half-time professor, two and a half teaching assistants, and two student assistants. Staff members register students, administer tests, keep records, tutor in their specialties, and maintain equipment. Two classrooms, two offices, and a dozen small cubicles are housed in the Center.

Future plans are dependent on needs of professors, availability of self-study materials, and financial support. Although the College has audio laboratories separate from the Center, a small installation with dial-retrieval capability is a current need. Liaison is maintained with the College Computer Center, and a remote console for the computer is a possibility in the near future. Other physical needs include student study carrels and several small auxiliary rooms.

The implications for such a center are great. It facilitates independent study for those whose rates of learning differ from the norm, presents a new type of learning laboratory which professors may exploit, and offers an opportunity for the academic community to interact with many of the new technological media.

While formal evaluation procedures have not begun, informal comment to date has been most favorable.

Liaison Consultants
Florida Atlantic University, Boca Raton
Harvey K. Meyer

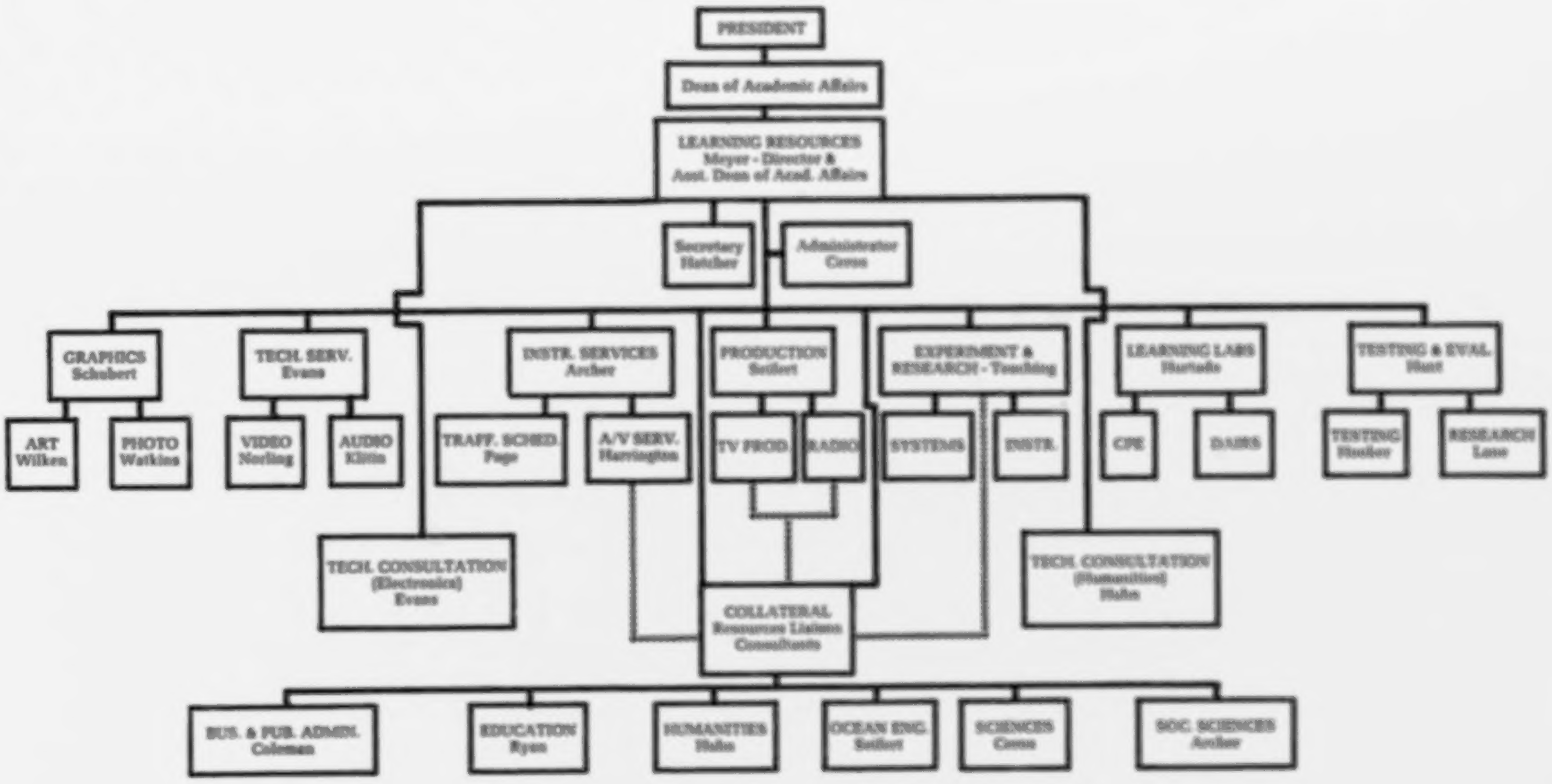
The Division of Learning Resources at Florida Atlantic University provides as resources liaison consultants who assist professors in their respective colleges in finding and producing instructional materials.

In operation, a faculty member who wants to produce materials of any kind for his courses discusses his idea informally with one of the consultants. When

FLORIDA ATLANTIC UNIVERSITY

Functional Organization
and Incumbent Personnel

THE DIVISION OF LEARNING RESOURCES



his plans are firm, he writes a request to Learning Resources, with a copy to his dean. Upon approval, budgetary allocations are made, and production is scheduled; the materials are used and evaluated, and revised as necessary.

The organization chart on the previous page indicates the operating relationships.

Audiovisual Services in the Library
Marywood College, Scranton, Pennsylvania
Sister Mary Constance, I.H.M.

A building complex housing the Marywood College library and all audiovisual sources on campus opened for service in 1967. The uniqueness of this complex is in the physical relationship of audiovisual media to the library and books on one hand and to audiovisual instruction, learning laboratories, and educational television on the other.

The library provides shelving for 150,000 volumes and seats 500 students. It provides the usual services — teaching, bibliographic, reference, loan — plus the newer mechanical and photographic services of the modern library. Individual student carrels will be interspersed among the books in a quiet atmosphere of work-study.

The audiovisual building houses language laboratories, individual learning equipment, audiovisual instruction classroom and laboratory, graphic production areas, a college mobile TV unit, a repair shop, and also the studio and broadcasting facilities of the Northeastern Pennsylvania ETV station.

At the juncture of the two buildings are located the audiovisual loan facility, with the circulation desk accessible from either of the two buildings, and the 30 program sources for the remote-access units strategically located throughout both buildings and with potential expansion to other areas of the campus.

The library staff, audiovisual personnel, and individual faculty members are developing a tape collection for use with this future remote-access system. Some faculty members also will produce their own tapes for either short- or long-term use. This system will enable students to listen to required musical arrangements and the spoken-word recordings without wasting class time and hopefully will be popular with both faculty and students on a wide variety of programs.

The dial stations have been placed in carrels located on all three levels of the library where they will be convenient to students using various categories of books. A few dial stations also have been placed in group areas, and the system is to be tied in with the consoles in the learning laboratory areas.

Faculty members making listening assignments to preprogramed tapes may announce the dial numbers to their classes; in addition, a card file duplicated and placed in each area in which there are listening stations will make this information readily available to listeners. Provision also will be made for meeting requests for nonprogramed tapes.

The Media Consultative Process
Miami University, Oxford, Ohio
John Dome

The Audiovisual Service at Miami University is subdivided into four units: Consultation, Utilization, Materials Library, and Production. This report focuses on the Consultation unit. Established 6 years ago, the unit now has four instructional materials consultants, whose specific role is that of liaison between the teacher and the technical services of the Audiovisual Service. Consultation is the heart of the media program. Through observation, discussion, evaluation, design, and coordination the consultant brings the array of instructional resources to bear on the solution of teaching problems.

Miami University has developed a regularized, formalized approach to consultation. To increase their opportunities for service and contribution, the consultants take two approaches to their work. First, they attend one or two classes just as if they were students. The selection of a specific class occurs as a result of the teacher asking for the consultant or because the consultant feels that he might be able to be of assistance. The second method of operation is the more obvious: the client — the teacher — contacts the consultant on a specific matter. From a consultant's point of view, the former approach is the most challenging. It is in the after-class discussions that his observations and suggestions are seriously questioned by the teacher and his imagination most called upon for solutions. Final evaluation of merit and contribution of instructional resources must rest with the teacher.

Consultation consists of deliberations between two persons — one (the consultant) with *specialized* knowledge of resources and techniques, the other (the teacher) with content knowledge, definition of goals and objectives, and ultimate evaluative decisions. The consultant focuses his attention on presentational techniques; he selects, plans, and designs materials, leaving content decisions solely to the teacher. The exchange of such specialized knowledge creates an evolution of ideas that demands the highest professional performance from each.

The imperative first step in consultation is establishment of a rapport and understanding between consultant and client. The consultant must keep in mind that, regardless of his good intentions, his help to the client is of value only when so perceived by the client. Recognition of this need leads to the second step in the consultative process. The client must define and describe the problem as he sees it before the consultant adds his definitions and descriptions. From these exchanges evolves a mutual exploration resulting in tentative solutions. The process involves selection from existing resources; simplification, modification, and incorporation of these resources; and design and construction of new resources.

A milestone is reached when the client says, "I'll try it that way." From that time on, evaluation, revision, and modification are in order. All materials, all ideas are not superior or final, but a significant step has been achieved by teacher involvement. Some of the materials developed by this process are in the fourth year of revision; other items seem to require no change after many uses. When a teacher says, "It took me two lectures to present this concept in the past. Now, with these three transparencies, I accomplish the same objective in 30 minutes," a consultant can feel that his has been an effective contribution.

It is essential that the consultant enter the relationship as a person of authority — authority based on a position of specialized knowledge. It also is important that he realize that he is outside of his client's problem and that his role is one of help to the client and not one of self-glorification. It is from necessity and difficulty that the need for assistance arises. From these stem the contact, the rapport, the discussions, the evolution of solutions. Often forgotten but also highly significant to the consultative process are the need for regularity of contact and the specification of objectives and plan of consultation. Infrequent contacts and desultory recommendations produce nothing but frustrated and disbelieving teachers.

Consultants must realize that there may be factors militating against their potential contributions — such as threat to teacher status, and teacher's resistance to change, disbelief in the value of resources, uncertainty of performance, or poor past experience with media.

A constant and ever-increasing use of the media consultative process at Miami University has justified its continuation and expansion. Success is keynoted by a request to a consultant to "Come back next year *and 'take' still another course in the department.* All in the department are benefiting either directly or indirectly."

Faculty Involvement in New Media
Oklahoma State University, Stillwater
J. C. Fitzgerald

All classrooms on the Oklahoma State University campus, approximately 180 of them, are equipped with projection stands, screens, and an overhead projector. Sufficient tape recorders, carousel slide projectors, 16mm projectors, 3¼" x 4" slide projectors, sound film slide projectors, opaques, and other types of audiovisual equipment are available to meet most of the needs for such equipment at this time.

The entire faculty through the department heads were involved in determining what equipment should be acquired and where it should be placed. Of course, such equipment is of little value without materials to use with it. To meet this need several steps were taken:

1. A series of seminars were organized for faculty members and were well attended. The first seminars were demonstration sessions to acquaint faculty members with possible types of materials that can be produced. Two one-day sessions were scheduled for faculty to come in and work with the local staff and factory representatives in making transparencies. Following these seminars and workshops, continuous seminars will be presented periodically for all faculty members who wish to make their own projectuals.

2. A trained production specialist has been employed to conduct seminars for faculty, to assist them in producing their own materials, or to do the production for them. A laboratory work area is equipped with a variety of production equipment including Diazo printers, Varitype printer, copying cameras, Thermofax printers, and others set up for training and production use.

3. An art department has been added and equipped to design and prepare all kinds of visuals such as charts, posters, and originals for transparencies and overlays. Three artists are already busy with production of visuals for both campus and extension.

4. Under construction is a new addition to the University library, and the audiovisual department designed the second floor and part of the third floor for housing the Audiovisual Center. In addition to the usual audiovisual space requirements, plans for the new quarters include a special area for faculty members to work on their own visuals if they wish to produce them personally. Assistance will be provided. Listening carrels for students or faculty to play tapes or view filmstrips and slides are provided. A number of small preview rooms and three larger projection rooms will be available, as well as darkrooms for processing filmstrips and slides. A soundproof recording studio complete with glassed control room is included in the audiovisual facilities. This will make possible recordings of glee clubs and other musical groups, speech, or sound motion picture sets. It is expected that these facilities will be too small within 5 years, and consideration now is being given to a learning resources center which will house all kinds of instructional media in a core surrounded by classrooms and auditoriums.

Instructional Materials Center
Orange Coast College, Costa Mesa, California
James S. Fitzgerald

The Instructional Materials Center of Orange Coast College has been set up to assist faculty members in the development of a wide range of materials for classroom use. The Center types, reproduces, and compiles college-related materials for instructors and assists in operation of equipment as required. A very complete reproduction unit includes, in addition to conventional equipment, an offset press, electrostatic scanner, collater, paper folder, paper drill, and bulk paper cutter. Equipment is operated during stated hours by Center staff; instructors may operate most of the equipment themselves during evening hours.

Audiovisual equipment may be signed out by faculty members from several campus repositories and in some cases may be permanently assigned to a classroom. Center staff provide instruction in operation of equipment, order materials from a wide range of sources, advise on availability of materials, and assist in design and production of materials. A film and tape preview room is available.

Instructional supplies for instructors — duplicating paper, typing materials, and miscellaneous items — are stocked by the Instructional Materials Center. In addition to providing for centralized purchase, storage, and inventory, this arrangement also brings faculty members to the Center, where they may find it convenient to explore possibilities of utilization of new media in their classes.

A Fund for the Improvement of Teaching

Pennsylvania State University, University Park

Leslie P. Greenhill

The Office of the Vice-President for Resident Instruction at Pennsylvania State University has established a central Fund for the Improvement of Teaching. The objective of the Fund awards is to stimulate improvements in teaching at the University. Grants may be used to support exploration of new instructional methods, development of special instructional materials, or self-improvement of teachers on the faculty.

Grants will be made directly to individual members of the University's teaching faculty; full-time and regular part-time faculty members on any of the University's campuses are eligible to apply for awards.

Grants may be used to —

1. Explore new methods of teaching or testing, or evaluating classroom instruction.

2. Finance production or purchase of special instructional aids for which departmental or college funds are not currently available.

3. Finance construction and testing of unusual instructional equipment which is not available on the market.

4. Finance collection and/or analysis of data related to improvement of instruction.

5. Support self-improvement of teachers by providing travel funds and/or fees for attendance at special meetings or training programs related to improvement of instruction. Such grants will be restricted to the support of travel within the continental United States and do not apply to attendance at regular professional meetings.

6. Carry on other significant projects relevant to improvement of resident instruction not covered by the preceding categories.

Preference is given to those projects which stress innovation and immediacy of application, which relate to the upgrading of faculty members' current teaching activities, and which have the possibility of improving learning and/or saving faculty members' and students' time. Individual grants are generally in amounts up to $300 and for projects not exceeding 1 year in duration.

An Integrated System of Instructional Services for the Faculty

Pennsylvania State University, University Park

Leslie P. Greenhill

Over a number of years a variety of instructional services were developed at Pennsylvania State University. These were located in different administrative agencies and were not well coordinated. In recent years most of these services have been drawn together into one agency called the University Division of Instructional Services. The function of these services is to support the faculty of the University in its teaching mission. At the present time these services include the following:

1. *Instructional research and course development services.* The Division assists departments and faculty members to develop courses, to produce programed materials, to plan and evaluate new instructional methods and procedures, and to design new instructional systems. It assists departments in preparing proposals to obtain support for research on important aspects of teaching and learning at the university level.

2. *Examination and test services.* The Division assists individual faculty members or departments in the construction, analysis, scoring, and improvement of examinations.

National Education Association photo

3. *Instructional TV services.* The Division provides closed-circuit TV facilities and personnel to support the instructional programs of the University. Assistance is given in developing and adapting courses for television and for recording on videotape or audiotape.

4. *Motion picture services.* Personnel and facilities are available for making 16mm motion picture films for instructional use and for research projects. Scientific films, including those involving cinemicrography, and slow motion and speeded motion (time lapse), are also produced. The motion picture service also makes 8mm single-concept film loops and high-quality audio recordings.

5. *Still photography services.* The still photography unit makes 2" x 2" and 3¼" x 4" slides for use in resident instruction.

6. *Instructional graphics services.* Graphic arts services are available to prepare visual materials, e.g., charts and illustrations, for use in televised and other courses. Large transparencies for use on the overhead projector also are designed and produced for the faculty.

Members of the Division staff work with individuals and small groups of faculty members; however, a plan is being developed to provide seminars to assist new faculty members and graduate assistants in developing teaching skills, especially those involving newer media. A specially designed building which will house all of these services in one location is now in the advanced planning stages.

Project Reward*

Rensselaer Polytechnic Institute, Troy, New York

Philip H. Tyrrell

The Office of Institutional Research, Rensselaer Polytechnic Institute, performs three primary functions: (a) provision of educational media services for faculty, (b) participation in educational research and development activities of the Institute (sometimes involving cooperative projects with other institutions), and (c) continuing statistical analysis of instructional program data.

If institutional research is broadly defined as the study of problems connected with the operation of the academic programs of an institution, plus an attempt to implement solutions to these problems, then the concept of such research may well encompass the role of educational media experimentation and utilization. As defined, this concept supplements the idea of research with the idea of action, and these two ideas — research and action — are implicit in the original objective of Project Reward: to assist faculty in undertaking educational experimentation so that more effective instruction — at less cost than might reasonably be expected — will result. This original objective still provides the main guidelines for the Office of Institutional Research in the conduct of its campus-wide operations.

To attain its present scope and volume of activity, the Office has developed the following major programs:

1. Cooperation with faculty in the study and application of innovative instructional procedures, usually in the field of newer educational media. (For example, use of closed-circuit television in chemistry, engineering graphics, mechanics, and physics; production and use of instructional films in chemistry, civil engineering, economics, engineering graphics, language and literature, management, psychology, and physics; and use of combinations of media in conjunction with special classroom facilities in architecture, biology, economics, history, and physics.) This program assists the academic administration in stimulating instructional experimentation among faculty, including the generating of experimental projects and preparation of proposals.

2. Provision of routine educational media advisory, production, and operator services for faculty. (For example, design, production, and use of materials involving art work and still or motion picture photography; equipment selection; and operator services for multimedia classrooms.)

3. Collection, analysis, and internal publication of operational instructional program data for use by academic and general administration. (For example, preparation of annual statistical analyses as well as trend and other summary reports.)

4. Internal distribution of information on current developments in higher education, and exchange of information with other institutions on matters involving educational media applications and analytical uses of instructional program data.

The uniqueness of these programs is that they form a continuum of coordinated activities ranging from the routine to the experimental and that they represent a university-wide attack on such operational problems as increasing numbers of students, rising costs, and the continuous need to modernize methods of instruction. Taken as a whole, these activities have doubled in variety and volume during the last 5 years. Most importantly, they offer to faculty and staff one avenue for accomplishing significant educational change.

Audiovisual Services at San Jose State College

San Jose, California

Richard B. Lewis and Jerrold Kemp

The primary functions of the Division of Audiovisual Services are to provide educational and logistical support for the general improvement of instruction and to increase efficiency of teaching and learning within the institution.

The scope of audiovisual services extends to a variety of educational media (other than printed materials) and includes materials, equipment, and proisions for their essential support: films, filmstrips, slides, transparencies; audio media; televised instruction in various configurations; and miscellaneous teaching resources.

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* Project Reward, established in the summer of 1956, operated on a project basis until July 1961, when it was redesignated as the Office of Institutional Research.

A guiding principle affects organization: the location or sponsorship of services is not important, provided that the services are readily available to the faculty and students; thus some long-established services are maintained where they were initiated (for example, disk recording circulation and listening facilities in the College library); however, technical support of such services is supplied by the Audiovisual Service Center.

Production of materials is a service provided when appropriate commercial resources are not available. Services to the faculty and students are without charge or recharge procedures and are funded in the College instructional budget. Resources in the Division are selected by faculty members for specific instructional purposes; items are purchased or rented according to extent of use or permanency of value. Consultation with faculty and students on audiovisual needs or resources is a major responsibility of Division personnel; every effort is made to locate, recommend, and supply appropriate instructional materials to meet instructional needs.

In the Audiovisual Service Center, a three-story, 18,000-square-foot building, three administrative units are situated: utilization services, materials preparation services, and technical services. Each unit is guided by a specialist-coordinator with a staff. Plans are in progress for future facilities in a proposed new Library and Teaching Resources Building.

The primary function of utilization services is to make available to the instructional program the best of commercially produced motion pictures, filmstrips, tapes, and similar instructional materials. And, in order to encourage effective use of these materials, not only are they loaned over the counter, but projection and recording services are provided for faculty members. Trained student projectionists take materials and necessary equipment to classrooms, run the films, and return them to the Center. Further, the Center provides a library of films and filmstrips owned by the College and also obtains, by rental, borrowing, or exchange, additional resources not in the Center library. No recharge system is required, and red tape is kept to a minimum.

To implement the use of films and other media, the Center also maintains card and computer printout catalogs of all audiovisual materials available in the Center for use by faculty and students, as well as from sources outside the College. Obtaining new materials for preview and providing previewing and searching services for new materials are also tasks of the Center.

Materials preparation services have been given priority support in the Division program. With professional direction and competent photographic and graphic staff, this activity plans with faculty for the preparation of a wide variety of instructional materials to be used directly in class instruction. When commercial materials are not available or are not appropriate, media are selected, and visualized presentation materials are planned and produced. In general, emphasis is on low-cost materials such as slides, transparencies, flat pictures, mounted displays of charts, diagrams, and pictorial materials; motion pictures are prepared in 8mm or 16mm, silent or sound, when highly specialized teaching problems can be solved only with this medium.

Since effective use of instructional materials requires adequate physical facilities and proper and controlled conditions, a priority concern of the technical services unit is planning for and implementing the technical aspects of the College audiovisual program. Circulation and maintenance of equipment and provision of room facilities such as projection screens, stands, darkening, conduits, and other mechanical conveniences are included in the staff responsibilities. Lending equipment to faculty and students, training and supervising projectionists, and caring for the variety of audiovisual installations throughout the campus also are major activities.

A fundamental and guiding belief of the College administration is that any medium that can improve teaching and learning should be explored, tested, and, if considered valuable and economically feasible, adopted and supported. Through the Division of Audiovisual Services, this belief is nurtured and implemented.

The entire staff of the Division is active in the professional organizations appropriate to the responsibilities of each individual. Staff members work with colleagues both on and off the campus in the study of their field and its expanding potential for service. When improvement and efficiency of teaching and learning are considered, the Division of Audiovisual Services — along with the library and other campus agencies supporting instruction — is involved.

Instructional Resources Center
State University of New York at Albany
Robert C. Rowe

Building plans of the State University of New York include a Communications Lecture Center with production facilities to be located at each of the 11 four-year colleges to serve their campus needs. The University centers at Albany, Binghamton, Buffalo, and Stony Brook will be large production centers to support their individual campuses. They also will be equipped with staff and facilities to provide supplementary production of teaching materials for the various units within their region.

The program in terms of physical space and facilities of the Communications Center at Albany indicates the advanced design of the facility planned.

> The design of this building is based on the proven effectiveness of instructional aids in improving, both qualitatively and quantitatively, the teaching-learning process. The space program, there-

fore, defines a number of lecture halls varying in size and equipped with instructional aids, as well as the facilities for the production of film materials, "visuals," demonstration apparatus and televised instruction.*

The building is a nondepartmentalized facility. Its concept is based on methods of instruction rather than disciplines, curriculums, or courses, and it will be designed to support and aid the instructor and instruction in every possible way. As a multimedia communication center, it will provide a high degree of flexibility in use.

The production center can be thought of as housing a manufacturing process, with the end result being the slides, films, charts, etc. For instance, the graphic arts studio will produce materials for both film and TV use as well as for direct classroom use. With the exception of possible offices and some workshops, the building will be windowless and air-conditioned throughout.

The building will contain 20 lecture halls ranging from 60 to 500 in seating capacity. Each lecture hall will be equipped with a rear projection room with projection equipment for multimedia display on the rear projection screen. Each of the larger lecture halls will also have a preparation room for setting up of demonstrations and preparation of lectures.

In addition to using existing teaching materials such as slides, films, and transparencies, this building will include four TV studios equipped with image-orthicon cameras, two motion picture production studios, a complete photo and graphics section, and a materials library and dissemination center.

From the master control room, it will be possible to feed 12 different sources of information to all the lecture halls as well as to a campus-wide closed-circuit hookup.

The Center will be independent of any particular discipline or academic department. A lecture hall may be used for physics presentation one period, a history presentation the next, and a biology presentation the third.

The production areas support widely diversified activities. Functions provided include film production; audio recording; graphic arts production; demonstration assembly and setup; TV origination; control, distribution, and recording; and storing and issuing of teaching materials.

It is further contemplated that this teaching and learning resource center will include a group of research specialists in communication theory and human and social behavior to act as consultants to the teaching faculty in the design of courses for maximum effectiveness. These consultants will be primarily educators and content authorities but will also know how television can best be used to motivate learning.

Facilities are included eventually to connect response units at the student seats to the computer center for instant read-out of information about instructor effectiveness and student achievement.

A major service of this facility also will be the production and origination of telecourses for use on the State University network.

Extended Symposium on College Teaching

University of Bridgeport, Bridgeport, Connecticut

George E. Ingham

The University of Bridgeport faculty constantly emphasize quality in instruction and look for a variety of means to improve teaching techniques. To assist them in this endeavor and so that they might have ample opportunity to become more conversant with rapidly developing educational technology, the College of Education applied for and received from the University Parents' Association a grant for financial support of what is called an "Extended Symposium on College Teaching." The purposes of this symposium, which is open to all members of the College faculty, include (a) development of a heightened awareness of individual instructional problems and needs among faculty members; (b) exploration of new developments and trends in college instruction; and (c) creation of opportunities for faculty members to improve their instruction within the context of new ideas.

Funds made available by the grant are being used to bring to the campus four scholar-consultants, considered outstanding in the field of college instruction. Each is to make a presentation in his area of expertise to the University faculty and to remain on campus for a period of time to consult with entire colleges, departments, and individual faculty members. It is anticipated that innovative approaches to teaching, providing immediate as well as long-term benefits to the student body, will be among the outcomes of these extended visitations.

The theme around which the symposium has been organized is "New Initiatives in College Teaching." The first scholar-consultant brought in to implement this theme used multimedia techniques to illustrate his discussion of the topic "The Systems Approach to College Instruction." Other topics to be pursued by scholar-consultants during the year and exemplifying emerging trends in college teaching may be selected from the following:

Humanistic Approaches to Learning
Programed Instruction
The Use of Simulation in Learning
Television as an Instructional Medium
Cooperative Teaching
Individualizing Instruction
Group Approaches and Dynamics in Teaching.

A faculty committee consisting of representatives of the colleges has been established to identify, after survey, the specific aspects of instruction which seem to be of most interest and concern to the majority.

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* State University of New York, Office of the Architect, Space Requirements of the Communications and Lecture Hall Building at Albany.

the basis of recommendations made by this com- ttee, the remaining scholar-consultants are to be lected for visitation to the University of Bridgeport. Interest in and enthusiasm for even greater use of e media facilities of the University have been nning high since the inauguration of the Extended mposium on College Teaching in 1966. Requests e increasing for more technological tools for instruc- onal purposes, and the symposium, unique on uni- rsity campuses, seems assured of continued success.

udiovisual Seminars for Faculty
niversity of Washington, Seattle
oyd F. Baldwin

The Health Sciences Division at the University of Washington faces a major expansion of more than 60 percent between the years 1968 and 1975. The Divi- ion comprises the Schools of Medicine, Dentistry, Nursing, and Pharmacy, with associated clinical and teaching facilities of the University Hospital, the Primate Center, and graduate biological sciences. The administration desired to implement measures whereby faculty could be actively involved in planning the application of newer technologies to teaching techniques and facilities.

The Audiovisual Service offered a monthly seminar oriented toward raising the level of faculty acquaintance with development and utilization of instructional media. The series was titled "Adventures in Teaching." The real message of each seminar was carried through some unusual vehicle of communication as, for instance, an intercampus communication network. A faculty mailing list of selected names was developed and placed on addressograph plates, and an initial announcement of the month's upcoming program was mailed 2 weeks prior. With a lead of 10 days, posters were distributed throughout the Division, and immediately following the presentation a follow-up report was mailed to the entire faculty.

An effort was made to involve administrative officers and instructional leaders in other disciplines on and off the campus. All seminars were committee-planned at least 8 weeks prior, and persons were then invited to accept assignments. Frequently it has been possible to use talent from other areas of the country.

Attendance has varied from 60 to 150. With the competition of day-by-day responsibilities and unavoidable conflicts, we estimate that our possible audience numbers 250 from among a staff of 500. Thus, on one or two occasions 50 percent of the available group has been reached directly; others are reached through the report. Audience reaction is high and is a vital aspect in building climate for subsequent sessions. New contacts with staff inevitably result, leading to new media developments for the teacher and the institution. The seminars offer a forum in which the teacher may express his problems and share his successes with colleagues; graduate students and professors find them a new medium in which to accumulate the appraisals of their associates. The seminars appear to have created a climate in which faculty support for advanced teaching facilities will thrive.

INSTITUTIONAL INVENTORY

Anne Arundel Community College, Severna Park, Md. Facilities in library for individual and group listening and viewing, in carrels and small rooms. Equipment includes TV as well as films, slides, headsets. No dial access. (James D. Forman)

Brevard Junior College, Cocoa, Fla. A unified administrative unit for all educational services: TV, radio, AV, listening labs, instructional labs, instructional research, library, data processing and technical research. (William K. Cumming)

California State College at Hayward. Center for Independent Study has self-study materials and tutorial help. (John D. Hancock)

Canal Zone College, Balboa. Unified book/nonbook Educational Resource Center has been organized. Duties of resource specialist recently defined. (Gary T. Peterson)

Case Institute of Technology, Cleveland, Ohio. A Department of Instructional Support provides (a) a direct service for design, development, and production of teaching-learning resources; (b) a program of consultation to seek new ways to assist the learning-teaching process; (c) a source of information on use, production, and availability of all media; (d) research into machine methods for assisting educators; and (e) a communication link between Case and other groups. (William F. Schneerer)

Chaffey College, Alta Loma, Calif. Educational Media Center (now in planning stage), will have a faculty media preparation room; 32 carrels for students; CCTV transmission and taping. (Rex W. Wignall)

Colgate University, Hamilton, N.Y. Social Science Materials Development Center has a small TV studio and an AV laboratory. (Lester H. Blum)

College of Marin, Kentfield, Calif. Two trailers have been joined to provide a classroom with carrels equipped for use of 8mm film, slides, audiotapes, and videotapes. (Donald R. Greenfield)

College of St. Benedict, St. Joseph, Minn. Library Resource Center will house central control for dissemination over entire campus of videotapes, audio, and film. CCTV, telelecture, and dial access now in planning stages. (Sister Margretta Nathe)

Duke University, School of Medicine, Durham, N.C. Science teachers seeking more effective ways of teaching have been successful in uses of TV, teaching machines, and programed learning. Other ways being sought to give students maximal assistance in learning. (J. E. Markee, S. A. Agnello, and F. D. McFalls)

Eastern Washington State College, Cheney. Instructional Communications Center produces films, slides, display boards, resource file of AV materials, programed instructional materials, and self-instructional laboratory. (Thomas K. Midgley)

Florida Atlantic University, Boca Raton. Use of subject area consultants to assist faculty in producing instructional materials. (Harvey K. Meyer)

George Peabody College for Teachers, Nashville, Tenn. Learning Resources Center includes (a) curriculum laboratory; (b) sample textbook collections; (c) services, equipment, and film clerk personnel of the AV Department; (d) sample test collections; (e) TV teaching laboratories and studios; (f) demonstration and research in teaching machines, automated tutoring devices; (g) high-speed electronic data-processing equipment; and (h) materials and equipment for production of graphic aids for instructional purposes. (Curtis P. Ramsey)

Indiana University, Bloomington. The AV Center, in addition to the centralized program, has under way a program to establish media subcenters in a number of classroom buildings around the campus. (L. C. Larsen and Gene Faris)

Junior College District of St. Louis—St. Louis County, St. Louis, Mo. Board policy encourages release of faculty time for research and development in improvement of instruction, including plans for utilization of new media. (David Greenwood and Robert C. Jones)

Lafayette College, Easton, Pa. Elaborate CCTV in classroom and cubicles permits presentation of experimental stimuli and observation of human or animal subjects. (J. Marshall Brown)

Langston University, Langston, Okla. Learning Center focuses on freshmen; provides dial access and carrels on Oklahoma Christian model. (Mamie Slothower)

Los Angeles City College, Los Angeles, Calif. A comprehensive instructional materials laboratory receives material from instructors for individual study by students who need extra help. (Alice Floyd and Paul Whalen)

Los Angeles Valley College, Van Nuys, Calif. Study Skills Center includes programed instructional materials, teaching machines, self-tutoring aids, and Listening Center. (M. Jack Fujimoto)

Marywood College, Scranton, Pa. A building unites library and audiovisual services in carrels (dial access) located in stacks and elsewhere. Audiovisual wing expected to house language laboratories, individual learning equipment, AV instruction classroom, laboratory graphic production areas, a college mobile TV unit, repair shop, and the studio and broadcasting facilities of the Northeastern Pennsylvania ETV Station. (Sister Mary Constance)

Miami University, Oxford, Ohio. The Audiovisual Service is subdivided into four units: Consultation, Utilization, Materials Library, and Production. Role of instructional materials consultants in the Consultation unit is that of liaison between the teacher and the technical services of the AV Service. (John Dome)

Monroe Community College, Rochester, N.Y. Maintains an AV complex of 24 rooms in which to produce slides, films, CCTV, videotapes, audiotapes, and self-instructional media; 9 separate video lines; 7 multimedia rooms. The instructors have only to ask for what media equipment or services they want. (Eugene Edwards)

Monterey Peninsula College, Monterey, Calif. Emphasizes improvement of instruction; consultation of coordinator of instructional services with faculty; de-emphasis on routine delivery of equipment and materials. (Leon Fletcher)

Oklahoma State University, Stillwater. Has made use of faculty in-service seminars to acquaint faculty members with possibilities of uses of new media. (J. C. Fitzgerald)

Orange Coast College, Costa Mesa, Calif. Instructional Materials Center prepares and reproduces instructional materials, distributes projection equipment, issues instructional supplies; maintains offset presses, photography services; several varieties of copiers available. (James S. Fitzgerald)

Pennsylvania State University, University Park. Fund established to permit grants to faculty members to explore new methods of instruction or to support self-improvement of teachers. Integrated instructional services provided for course development, examinations, TV and film production, still photography, and instructional graphics. (Leslie P. Greenhill)

Polytechnic Institute of Brooklyn, New York, N.Y. Special production facility being planned to provide education and development of personnel interested in computer animation. Resident staff members will be recruited from disciplines (electrical and industrial engineering, metallurgy, chemistry, physics) to educate outsiders in like fields in other institutions. Also will use summer workshops and orientation sessions to bring together film makers and scientists to explore this medium and to develop a repertory of computer programs (software) for animation of films in various subject matter fields. (L. Braun)

Purdue University, Lafayette, Ind. Film center provides students direct access to instructional films, tapes, slides, filmstrips, and disk recordings. Demand continues to grow. (L. D. Miller)

Rensselaer Polytechnic Institute, Troy, N.Y. A new Communications Center will be based on the School of Architecture's experimental classroom facility designed for college instruction utilizing TV, projection techniques, audiotapes, demonstration apparatus for optimum use of instructional aids. The Office of Institutional Research now provides (a) educational media services for faculty, (b) participation in educational research and development activities of the Institute, and (c) continuing statistical analysis of instructional program data. Has developed the following major programs: (a) cooperation with faculty in study and application of innovative instructional procedures; (b) provision of routine educational media advisory, production, and operator services; (c) collection, analysis, and internal publication of operational instructional program data; and (d) internal distribution of information on current developments in higher education. (Philip H. Tyrrell and Alan C. Green)

Rochester Institute of Technology, Rochester, N.Y. The Instructional Resources Center and Laboratory provides opportunities for cooperation with faculty, students, and administration in research and development, selection, utilization, and production of instructional materials. (Maurice Kessman)

St. Cloud State College, St. Cloud, Minn. Libraries, curriculum materials, AV center, and graphics preparation under one administration with staff trained in AV, curriculum principles, and librarianship. (Luther Brown)

San Jose State College, San Jose, Calif. AV Service Center houses utilization services, materials preparation services, and technical services. Makes available to instructors all varieties of instructional materials and services — including systematic analysis of learning resource requirements in relation to teaching objectives. (Richard B. Lewis and Jerrold Kemp)

State University of New York (SUNY) at Albany. Building plans include a Communication Lecture Center with production facilities to be located at all 11 4-year colleges in New York State to serve campus needs; to be equipped with staff and facilities to provide supplementary production of teaching materials for various units within each region. (Robert C. Rowe)

SUNY, College at Oswego. Office of Learning Resources includes services for all new media resources on campus. (J. R. Pfund)

Stephens College, Columbia, Mo. The Learning Center brings together in an integrated manner all aids to learning provided by modern technology, as well as traditional materials, making them readily available for both student and faculty use. Extensive modernization of facilities and staff organization. (Ralph C. Leyden)

Sul Ross State College, Alpine, Tex. The Multimedia Center of the West Texas Innovative Education Center will (a) furnish innovative media facilities, equipment, and materials for staff members of various educational institutions; (b) provide all types of films, graphic devices, and other media; (c) assist in procuring 16mm motion pictures, 8mm films, 8mm single-concept film cartridges; (d) offer consultation and planning service; (e) provide in-service education; and (f) develop programing of educational TV. (Bob W. Miller)

Taylor University, Upland, Ind. Consultant and specialized services to help prepare teachers to create and to use visual teaching materials. (Ross C. Snyder)

Troy State College, Troy, Ala. College operates the Southeast Alabama Educational Media Project to disseminate and encourage adoption of new educational ideas and practices. (Kenneth Croslin)

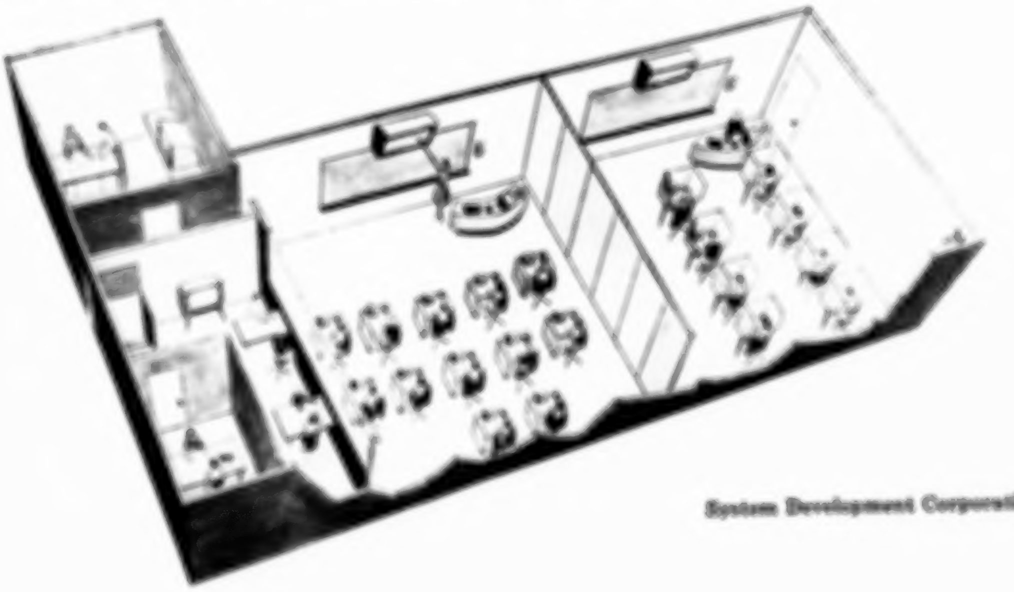
University of Bridgeport, Bridgeport, Conn. Offers an "Extended Symposium on College Teaching" intended to heighten awareness of faculty about instructional possibilities of various types, including "New Media." (George E. Ingham)

University of California at Los Angeles. Centralized service promotes use of communication media for instructional uses, research, and public service activities of campus. Helps to plan building, produces TV programs, operates TV equipment, produces films and graphs, and distributes AV equipment. (Frank E. Hobden)

University of California at Santa Cruz. Instructional Services Center includes (a) self-instructional programs, films, slides, recordings, tapes, maps, charts, diagrams; (b) AV support for classroom teaching; (c) storage, maintenance, and repair of equipment; (d) photography, including microphotography, aerial photography, photocopy, films and print processing, projection printing; (e) graphic arts services; (f) planning for physical facilities. (Marvin J. Rosen)

University of Colorado, Boulder. Bureau of AV Instruction has 5 objectives: (a) inform of services, (b) teach utilization and operation, (c) supply materials, (d) produce materials, (e) assist teachers in restructuring courses. Radio section produces and distributes (broadcasts) variety of programs. (R. E. deKieffer)

University of Hawaii, Honolulu. Service facility for faculty members includes films and production of instructional materials. Communications Center provides services in educational media for all depart-



System Development Corporation, Santa Monica, California ments and agencies of the University. (Walter A. Wittich and Richard Sanderson)

University of Iowa, Iowa City. The Center for Research in Educational Media Design, opened in 1966, is funded by the Upper Midwest Regional Educational Laboratory, through ESEA of 1965. The first major project of the Center is to attempt to bridge the knowledge gap between media research and the classroom teacher, grades K through 12. (Lee W. Cochran)

University of Minnesota, Minneapolis. The Laboratory-Seminar activity described earlier[*] has continued to expand. In operation or in the planning stage are satellite material centers in 3 areas of the campuses. Will be mainly equipment and production centers for classroom media. Another facility soon to be available is an auditorium complex with both rear and front projection, mostly automated. All new auditoriums or large classrooms provide for CCTV and systems of projection. (Wesley J. F. Grabow)

University of New Hampshire, Durham. New England Center for Continuing Education will include facilities for use and production of various communications media in continuing education seminars. (John D. Bardwell)

University of North Dakota, Grand Forks. Stenographic Bureau provides all printed reproductions and duplication; Instructional Communications Center prepares and produces projectuals. (G. H. Voegel)

University of Washington, Seattle. Offers a monthly seminar on "Adventures in Teaching" in the Medical School, with voluntary attendance of faculty. Considerable stress on utilization of new media. (Boyd F. Baldwin)

U.S. Naval Academy, Annapolis, Md. Experiment under way to apply systems approach to education in order to increase quality and effectiveness of learning; faculty summer study in preparation for intensive computer-assisted education production and use. (Major David H. Wagner, Paul L. Quinn, and William M. Richardson)

Wartburg College, Waverly, Iowa. Permanent self-contained custom-designed projection facilities in auditorium and lecture room of new (1967) Hall of Science. (R. A. Wiederanders)

Washington State University, Pullman. Uses "New Media File" folders for graduate students and faculty. Inserts new material as received. Also publishes small newsletter to faculty listing new acquisitions of the AV Center and brief notes and suggestions on media utilization. Objectives of the AV Center are to enrich course offerings and enhance quality of classroom instruction through use of appropriate materials and techniques. (Gerald E. Brong)

SUMMARY

The concept of on-campus administration of media services has progressed from the original purpose of providing films, projectors, and projectionists to the provision of media-enhanced services to professors and students that have the potential to revitalize and modernize instruction in all departments of the colleges and universities of America.

Innovation is the keyword of the reports cited and summarized in Chapter 14. Administrative services have been grouped on many campuses under the title "Instructional Resources Center." Their task still includes provision and maintenance of equipment, but it has extended to encompass also materials preparation of the most sophisticated kind; design of facilities to permit the instructional utilization of new display methods; and highly competent assistance to professors in the development of course objectives and of the means to pursue these objectives. The administration of media services has become, in all parts of the nation, an exercise in instructional leadership.

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[*] *New Media in Higher Education*, p. 139.

XV

CONCLUSIONS

DURING the course of the academic year 1966-67, staff members of the Higher Education Media Study gathered brief descriptions of instructional applications of new media from more than 500 professors in more than 300 colleges and universities. In addition, on-campus visits were made during this period to inspect and to talk about innovations in 60 colleges and universities, in an attempt to bring concrete observation to bear on the impressions garnered from the descriptions. As a result of this prolonged immersion in the sea of innovation, the editors have formed several tentative conclusions about "the state of the art" and its future. The reader should recognize that these conclusions are the responsibility of the editors and in no way reflect the stand of any of the contributing or sponsoring organizations.

Our first and perhaps most fundamental conclusion supports one of the suggestions presented by Professor Carpenter in Chapter 1: *Applications of technology to higher education seem to have been far more adaptive than creative.* All too often, the professor has exhibited the pleased naïveté of the child with a new toy, asking himself, "What can we do with this wonderful piece of equipment?" As a result, some of the most impressive present applications of new media in higher education are based on adaptations of unrelated hardware, adapted to worthwhile instructional purposes. The question has been, "How can the 360 be applied to improving instruction?" Ideally, the basic question should concern itself with purposes and goals — "What are we trying to achieve?" Then the second question might deal with means and with the development — the invention — of kinds of equipment that would flexibly, directly, economically, and justifiably facilitate the realization of accepted purposes. Until it is possible to operate in this sequence, it will continue to be true that educational goals at times are subtly redirected or even established by available facilities. An even more insidious danger is the possibility that the shift in emphasis might be inadvertent and unnoticed.

A second and related observation is *the need for concentrated effort both nationally and within regions and single institutions on the development of materials of instruction to be used with new media.* There is a great need for the development of credible software for higher education. Films, transparencies, programs, and tapes are becoming available for the lower schools, but so far there is a shortage of materials on a level appropriate for higher education. Perhaps the effort should be directed primarily to development and distribution of modular units of instructional software in such diversity that any instructor would be able to select from a rich array of resources those that fit his course, his students, and his personality, in much the same way that he is now able to select from many textbooks, to rearrange the chapters to suit his purposes, and to assign selected readings in the library to meet the interests and the educational needs of his students.

A third observation growing out of this study is that *physical facilities for instructional applications of new media still are inadequate.* Chapter 9 includes descriptions of several buildings that have been planned and constructed to facilitate the development, storage, and utilization of instructional media; but in far too many institutions the most modern of equipment is housed in the most ancient or most temporary buildings on campus. It is necessary for supportive staffs to "make do" with leftover space, antiquated equipment, and overworked personnel. If the potential of new media is to be achieved, it will be necessary for budget makers and policy determiners to undergird innovation with logistic support. Probably the greatest single encouragement to faculty members in improving instruction, and perhaps in achieving the economies that new media promise, will be the ready availability of competent paraprofessional staff, housed in efficient and well equipped quarters, to assist with the research and preparation of instructional materials that truly effective and creative teaching requires.

A fourth observation of the study is that *faculty development programs are essential elements in efforts to modernize instruction.* The inertia of college faculty in improving their own instructional techniques is proverbial. Perhaps the explanation can be found in the fact that each of us finds most satisfaction in doing the task that he finds both comfortable and satisfying — and too many college teachers find that the university community prizes other activities more highly than it does inspiring teaching of undergraduates.

However that may be, some outside stimulus and support are needed in order to encourage the instructor to exert the time and effort that are essential if he is to be able to improve the quality of his presentations in class. Recognition by the administration that improved instruction is important, expressed in the form of planned programs, finances, and time, is an effective first step in the improvement of instruction. This fact has been underscored by the inclusion of faculty development institutes in the authorizations of the Higher Education Act of 1965 (Title VI).

A fifth observation is that *the systematic approach to instruction* offers significant promise for the attainment of economies of effort and of instructional time in higher education.* It is a means of focusing on the problems of teaching all of the insights about learning and all of the techniques of displaying information that have been developed during the twentieth century. It should be applied much more widely in revisions of college courses. The atmosphere of the university, with its tradition of dedication to research and experimentation in every aspect of life except the performance of professors, would seem to be a most favorable environment for exploratory ventures in systems analysis. The urgency of the need for the benefits of course revision is emphasized by growing enrollments and rising costs; the convenience of such revision is enhanced by the presence on many campuses of expert personnel and excellent resources. The flexibility of scheduling in colleges and universities adds to the ease with which instruction could be updated — if only the urgent need for such modernization were a prime concern of faculty members.

Another important observation of this study relates to the conditions under which innovative and effective applications of new media to instructional problems can affect the intellectual atmosphere of an entire campus. These conditions could be expressed as a "law of critical mass" which recognizes that *no permanent and lasting effect in improving instruction through the application of new media will occur until there is a substantial institutional commitment to this purpose.* That commitment must include at least four elements: (a) administrative involvement expressed in financial support and in recognition of faculty participation, by means both of released time and of promotional policies; (b) adequate capital investment in both space and equipment; (c) technical staff to assist instructors in development of materials and in operation of technical equipment, with leadership of faculty status and with enough workers to complete requested work within a minimum time; and (d) faculty interest in improving the quality of instruction. If any one of these factors is absent in an effort to introduce new media innovation, it is highly unlikely that it will achieve any widespread and lasting influence on the quality of instruction in an institution.

An additional and gratifying series of observations may be summarized in a "law of primacy," a descriptive as well as a normative statement. This law states that *the primary purpose of the concern of higher education with new kinds of communication technology is the improvement of instruction.* At one time it was fashionable to promote the use of equipment because it would help to combat rising costs or permit larger numbers of students to be accommodated in existing facilities. On at least one or two campuses, it seemed to the observers that television or computers were being used primarily because they were fascinating equipment, and "because they were there." This condition seems to be definitely exceptional. The law of the primacy of instructional improvement is a clear deduction from the preponderant evidence. The primary emphasis of workers in the use of new media is on the improvement of instruction and the restoration of the personal element in the instructor-student relationship, rather than in effecting economies, in adapting to increased enrollments, or simply in extending the image of the instructor either to more classrooms or to more times of the day. While such ends were not ignored in any of the institutions studied, no institution claimed them as the primary objective of its experimentation.

In conclusion, the editors can testify that exciting breakthroughs toward improved instruction are opened by the waves of experimentation that are inundating campuses of all sorts in all parts of the nation. The seawalls that resist these waves, as always, seem to be composed of equal parts of inertia and poverty, but these are being eroded by the increasing force of successful examples. The future for anyone who believes that new media can encourage better teaching is bright.

One caution only: *The new media possess no magic.* They must be directed by humans to human ends. It is a perversion of their promise to use them only to facilitate outmoded purposes. The key to better teaching, now as ever, rests in the will of the teacher.

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* As outlined in Chapter 13.

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APPENDIX
Media Activity Inventory-Directory

THE 1967 "Media Activity Inventory-Directory" is reprinted here since it contains an important source of information, geographically presented, on instructional innovation in higher education.

HEMS
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HIGHER EDUCATION MEDIA STUDY
434 EAST WILLIAM STREET
SAN JOSE, CALIFORNIA 95112

A Project of the ASSOCIATION FOR HIGHER EDUCATION and the DEPARTMENT OF AUDIO-VISUAL INSTRUCTION of the National Education Association in cooperation with the Bureau of Higher Education of the U. S. Office of Education

Media Activity Inventory-Directory

February 1967

As an activity of the Higher Education Media Study (HEMS), the Association for Higher Education and the Department of Audiovisual Instruction of the National Education Association sought information, during August 1966, from some 1,400 college and university presidents concerning innovative uses of various educational media. All institutions involved were accredited and represented by memberships in the Association for Higher Education. This first mailing yielded returns from 286 institutions indicating one or more instances of new media utilization on their campuses.

In October, 1966, a similar request, accompanied by a preliminary Inventory-Directory of media activities in the 286 reporting institutions, was sent to both the presidents and directors of public information of institutions on the original mailing list. An additional 366 institutions responded, providing a total of 652 institutions in which new media activities were reported. The results of these two surveys are combined here in this final Inventory-Directory of new media activities.

Of a possible 2,207 institutions of higher learning in the United States, this study contacted approximately 1,400. While both the number of institutions contacted and the number of individuals designated and responding in each institution represent considerably less than the total population of each such group, the sample is believed to be sufficiently large and diverse with respect to type, size, and geographic location to be representative of new media activities in higher education throughout the country.

During the period between October, 1966, and January, 1967, persons whose names appeared on cards and letters returned from contacted institutions were invited to submit a brief article describing the nature, scope, and outcomes of each new media application in progress in their institutions. Of a total mailing of 938 letters for this aspect of the project, responses were received from approximately 300 institutions describing more than 500 separate media practices. It is these articles, in effect, that will comprise the bulk of a new volume, NEW MEDIA IN HIGHER EDUCATION (II), to be published late in 1967 as a joint effort of the Association for Higher Education and the Department of Audiovisual Instruction, National Education Association. The new volume supplements an earlier volume, NEW MEDIA IN HIGHER EDUCATION (I), published by the Association in 1963.

The HEMS staff wishes to express its appreciation to all contributors to this publication. It is hoped that the Inventory-Directory will prove a useful means of learning about other persons and institutions engaged in various innovative media practices and projects holding promise of improving teaching and learning in higher education.

JAMES W. BROWN — Project Director
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CONTENTS

A. Categories of Response

Responses of institutions to a postcard survey of new media activities are enumerated in summary form in the Categories of Response section. Twenty-seven categories, each identified by a code letter or code letter/numeral combination, were used to classify the new media activities listed by responding institutions. The number of institutions engaged in or planning to engage in each separate type of activity during the 1966-67 academic year is listed.

B. Index of Institutions

Institutions are listed in the Index of Institutions alphabetically by state and by the first significant letter in their titles (College of Marin and The Citadel under C, Syracuse University under S, University of Alabama under U). Institutions in the District of Columbia, Puerto Rico, and the Canal Zone appear following the last State. The individual or individuals responsible for new media activities listed under each institution are starred; code letters following identify these activities.

C. Index of Activities

A cross-reference is provided in the Index of Activities to identify institutions engaged in each separate media activity. The identification numeral of each institution listed in the Index of Institutions is used to identify activities which it reported in the survey.

D. Index of Personnel Responsible for Media Activities

Individuals responsible for new media applications in higher education are listed alphabetically by last name in the Index of Personnel. Beside each person's name appears: (1) the code letter or letters identifying the new media activity or activities for which he is responsible and (2) the identification numeral of his institution.

ADDENDUM

By January 30, 1967, an additional 14 institutions had returned postcard survey forms. Since the original cutoff date was January 4, these institutions are included in an addendum following the Index of Institutions. Listed alphabetically by state, each institution is identified by an X-numeral designator (X-1, X-2,...). Data listed by these institutions are cross-referenced to the Index of Activities and Index of Personnel and are tabulated in Section A under Categories of Response.

A. CATEGORIES OF RESPONSE

As of January 30, 1967, a total of 652 institutions returned new media questionnaire forms. Of these, 45 (7%) indicated that they were not using or did not plan to use in the near future any new media. Twenty-one institutions (3%) returned cards without designating new media activities.

Responses of the remaining 581 institutions listing at least one new media activity are summarized in Table I.

TABLE I.

CLASSIFICATION AND TABULATION OF 581 RESPONSES BY MEDIA CATEGORY

Number of Responses	Media Categories
174	A. Television (unspecified & other)
183	B. Closed Circuit Television
111	C. Videotapes and Kinescopes
27	D. Experimental Television and Mobile Television Units
150	E. Films
	F. Language and Listening Laboratories
18	F.1 Audiotutorials
41	F.2 Dial Access Units
173	F.3 Unspecified & Other
128	G. Audio Recordings
134	H. Programmed Instruction
	I. Self-instruction (other than Programmed Instruction) Procedures and Laboratories
31	I.1 Carrels
63	I.2 Unspecified & Other
	J. Computers
54	J.1 Computer Assisted Instruction
18	J.2 Data Processing
21	J.3 Information Storage & Retrieval
106	J.4 Unspecified & Other
57	K. Multi-Media Units
177	L. Transparencies (including 2" x 2" Slides, Filmstrips) and Overhead Projection
41	M. Tele-lectures
11	N. Tele-writers
20	O. Simulation
24	P. Systems
22	Q. Special Facilities
33	R. Administration
22	S. General ("advanced audiovisual aids" and the like)
13	T. Miscellaneous
14	U. Radio

B. INDEX OF INSTITUTIONS

ALABAMA

1. Auburn University
   - *Edward Wegener, Dir., ETV A
   - *Marvin Dawson, Dir., Learning Resources Center G
   - *Joe Mize, Dept. of Industrial Engr. J.4

2. Jacksonville State College
   - *Theron Montgomery, Dean B J.4

3. The Marion Institute
   - *Major M. C. Bomar, Asst. to the Pres. E F.3 G H J.4 L Q

4. Troy State College
   - *Kenneth Croslin, Dir., Educ. Resources Center P Q R S

5. University of Alabama, University
   - *James Jensen B
   - *Joseph T. Sutton, Dir., Institutional Resources A B C D E G H I.2 J.4 K L M O P

ALASKA

6. Alaska Methodist University, Anchorage
   - *G. W. Frost, Dean, College of Liberal Arts H

7. University of Alaska, College
   - *Arthur S. Buswell, Dean, Div. of Statewide Services E F.3 L

ARIZONA

8. Arizona State University, Tempe
   - *John P. Vergis, Prof. of Educ. I.2

9. University of Arizona, Tucson
   - *Edgar McCullough, Dept. of Geology A B
   - *R. G. Gustavson A B
   - *F. Robert Paulsen H
   - *C. W. Voris J.4
   - *Frank Barreca, Dir., Radio-TV Bureau A
   - *Willis R. Brewer, Dean, College of Pharmacy I.2
   - *Richard F. Childs I.2

ARKANSAS

10. Arkansas Polytechnic College, Russellville
    - *R. H. Daugherty, Div. of Educ. C

11. Arkansas State College, State College
    - *Charles Rasberry, Dir. of Broadcasting B
    - *James W. Boatman, Systems Analyist J.4
    - *Charles Yauger, Dir. of Data Processing J.4

12. Arkansas State Teachers College, Conway
    - *Cecil Garrison, Dir., Audiovisual B C

13. Little Rock University
    - *Norman Baxter, Vice Pres. for Academic Affairs F.3 G I.2

14. University of Arkansas, Fayetteville
    - *Richard Shurtz, Dir., Dept. of AV B Q R S

CALIFORNIA

15. American River Junior College, Sacramento
    - *Mrs. Audrey Menefee A C F.3

16. Cabrillo College, Aptos
    - *John R. Hinton, Dean, Instr'l Services B C F.3 G J.1 L

17. California State College at Fullerton
    - *William Schultz, AV Coord. A

18. California State College at Hayward
    - *John Hancock H
    - *Robert O. Hall Q R
    - *David Mahaney Q
    - *Arthur Kimmel F.3

19. California State College at Long Beach
    - *George E. Dotson, Dir., Educ. Services I.1 K Q

20. California State College at Los Angeles
    - *Adam E. Dieal, Dir., AV Educ. C H I.2

21. California State Polytechnic College, San Luis Obispo
    - *W. P. Schroeder, Head, Educ. Dept. L
    - *John Heinz, Chr., AV Dept. A

22. Chabot College, Hayward
    - *A. Don Donatelli, Dir., Instr'l Resources A F.2 G

23. Chaffey College, Alta Loma
    - *Rex Wignall, Dir., Instr'l Media Center A I.1 Q

24. Chico State College
    - *William Lane J.4
    - *Garrett Starmer A
    - *George Roseman S

25. City College of San Francisco
    - *Henry Liff A
    - *Rollin Hanson E

26. College of the Holy Names, Oakland
    - *Sister Stanislaus Marie A

27. College of Marin, Kentfield
    - *Albert C. Heppe, Dept. of Instr. E
    - *Stephen C. Bruff, Dept. of Geology E
    - *Shirley Conklin, Dept. of Nursing E
    - *Donald Greenfield, Dept. of Machines, Metals, Technology E

28. College of San Mateo
    - *John B. Dooley, Coord., Library Services F.3

29. College of the Sequoias, Visalia
    - *Henry M. Grumbling, AV Dir. F.2 K

30. Diablo Valley College, Concord
    - *J. Stanley Byrne, AV Supervisor A J.1
    - *John C. Kelley, Dean of Instr. A J.1
    - *Hubert C. Hambelton, Speech Dept. A J.1

31. El Camino College
    - *A. L. Swanson, Dean, Div. of Communication E H

32. Fresno State College
    - *Leonard H. Bathurst, Instr'l Media Center A F.3 G

33. Humboldt State College, Arcata
    - *W. J. Stradley, Dir., AV Services A G L

34. La Verne College
*V. H. Weybright, Asst. Prof. of Educ. L

35. Loma Linda University
*Edwin M. Collins, D.D.S., School of Dentistry
H

36. Los Angeles City College
*Louis Hilleary, Dean of Instr. A H I.2
*Alice Floyd, Asst. Dean, AV Services A H I.2
*Paul Whalen, Coord. Instr'l Materials Lab.
A H I.2

37. Los Angeles Trade-Technical College
*Alice Beuseng, Radio & TV A B E H L U
*Richard D. Vreeland, AV Consultant A B E H
L U

38. Los Angeles Valley College, Van Nuys
*Jack Fujimoto G H

39. Mesa College, San Diego
*Warren Heyer, Librarian G L

40. Monterey Peninsula College
*Leon Fletcher, Coord., Instr'l Services L
M Q

41. Mt. San Antonio College, Walnut
*Harriett Genung, Dean, Library & AV Services
E G L

42. North Orange County Junior College, Fullerton
*J. B. Nance, Instr'l Systems Consultant A
F.2 I.1 J.1

43. Occidental College, Los Angeles
*John McMenamin, Chr., Dept. of Biology H

44. Orange Coast College, Costa Mesa
*James S. Fitzgerald, Dean of Instr. H K Q

45. Palomar College, San Marcos
*Harry C. Mahan, Chr., Dept. of Psych. P
*Howard R. Brubeck, Asst. Dean, Div. of Humanities P

46. Pasadena City College
*Leslie Koetai H

47. Porterville College
*Lee H. Clearman, Dean of Instr. H T

48. Sacramento City College
*John R. Bucknell, AV Dept. B C E F.3 G H L

49. Sacramento State College
*Kenneth D. Norberg, Prof. of Educ. F.2 P

50. San Bernardino Valley College
*J. W. McDaniel, Assoc. Superintendent A
I.2 J.1 K
*James M. Yurkunski K
*E. R. Rothhaar A

51. San Diego State College
*Glen Fulkerson, Dir., AV Center B C H

52. San Francisco State College
*A. Daniel Peck, Coord., Educ. Technology K P

53. San Francisco Theological Seminary, San Anselmo
*Robert Lee O
*Henry Kuisenga O

54. San Jose City College
*Robert I. Nelson, AV Coord. F.2 G J.3
*Paul Elsner, Dir., Research and Planning
I.1 J.4

55. San Jose State College
*Richard B. Lewis, Dir., AV Services A H Q R
*Walter Kallenbach C
*Mrs. Gaither Lee Martin, Coord., ITV Services
A B
*William R. Rogers A

56. Santa Ana College
*Vernon L. Armstrong, Dean of Tech. Arts A E
F.3 G H I.2 J.4 L
*H. R. Blaustone, Instr'l TV Coord. B

57. Santa Barbara City College
*M. L. Huglin, Dean of Instr. H J.4

58. Santa Monica City College
*Win Smith, Supervisor, Instr'l Materials
Center F.3 G K L
*Harvey Kirk B

59. Sonoma State College, Rohnert Park
*Hal Skinner, AV Coord. B

60. Stanford University
*Dwight Allen A C
*Frederick McDonald A C
*Patrick Suppes J.1
*David B. Young C

61. University of California at Berkeley
*Kenneth Winslow, TV Coord. B S

62. University of California at Davis
*Charles Nearing, Educ. TV B

63. University of California at Riverside
*T. P. Jenkin, Vice Chancellor, Academic
Affairs A B E F.3 J.4 L

64. University of California at San Diego, La Jolla
*Charles F. Bridgman, Office of Learning Resources A E J.4 S

65. University of California, San Francisco Medical Center
*Irving R. Merrill, Dir., Communications
Office for Research and Teaching A
*Jack De Groot, Vice Chr., Dept. of Physiology
L

66. University of California at Santa Barbara
*A. Dale Tomlinson, Chancellor's Office A
F.3 J.4

67. University of California at Santa Cruz
*Marvin J. Rosen, Coord. Instr'l Services B
F.3

68. University of Redlands
*Al Johnson, Dept. of Drama B
*M. J. Smith, Dean of Faculty J.2

69. University of Southern California, Los Angeles
*Gregory Trzebiatowski, Dept. of Instr'l
Technology A B C D E F.3 G H I.2 J.4 K L M
N O P Q R
*James Mathes A

70. Ventura College
*Charles Plummer, Dean of Instr. H

COLORADO

71. Adams State College, Alamosa
*Lynn Weldon B

72. Colorado College, Colorado Springs
*John Shearer, Supervisor of Electronics
A B E F.3 G H J.1 K L P Q R

73. Colorado State University, Fort Collins
*Preston Davis, Dir., AV Services B D F.2
H I.2 M N

74. Colorado Woman's College, Denver
*Charles Rich, Head, Div. of Humanities S

75. Fort Lewis College, Durango
*Kenneth I. Periman, Assoc. Prof. of English
H
*Harry Rosenberg, Asst. Prof. of Mathematics
H
*Maynard Fox H
*Gina Harvey H
*Jeanette Martin H

76. Iliff School of Theology, Denver
*Kenneth W. Neal B C

77. Lamar Junior College
*Gerald H. Anderson, Registrar J.2

78. Loretto Heights College, Denver
*Sister Jane de Chantal C
*Sister Jane Godfrey C

79. Mesa College, Grand Junction
*Mrs. Helen Hansen, Radio & TV Speech H
*Lloyd Mountain, Foreign Lang. Dept. H
*Davis C. Holder H
*Alfred Goffredi H
*R. E. West H

80. University of Colorado, Boulder
*Otis McBride I.2 L R
*Robert de Kieffer F.3 K L R U
*Louis Brown E G M
*Harold Hill A B C D

81. University of Denver
*Charles M. Woodby, Dept. of Mass Communications B E G
*Noel Jordan, Dept. of Mass Communications D

82. U. S. Air Force Academy, Colorado Springs
*Chester F. Caton, Major, USAF, Assoc. Dir. for TV A B D Q

CONNECTICUT

83. Central Connecticut State College, New Britain
*M. J. Jannace, Dir., Data Processing Center J.2
*Charles A. Herrick, Dir., AV Services A H K L P Q

84. Connecticut College, New London
*William Holden, Chr., Dept. of Educ. E F.3 G H I.2 L Q

85. Danbury State College
*George J. Theisen, Dir., AV Instr. A

86. Fairfield University
*John J. Schurdak, Dir., Educ. Research J.1

87. New Haven College, West Haven
*Charles O. Dutton, Dir., Visual Aids F.3 L

88. Southern Connecticut State College, New Haven
*Michael F. Hannon, Dir., Multi-Media & TV Center A E

89. University of Bridgeport
*George Ingham, College of Education A E H
*Frank Hennesey, College of Education B

90. The University of Connecticut, Storrs
*Donald W. Friedman, Dir., Office of Public Information and Publications B J.4 P
*Stanley Quinn C

91. U. S. Coast Guard Academy, New London
*Captain R. J. Perry J.4 L

92. Wesleyan University, Middletown
Holman Lee, Science Asst. to the Provost J.4

93. Willimantic State College
*Frances Sullivan, Dir., TV F.2

DELAWARE

94. Delaware State College, Dover
*Richard Walker, Dir., Educ. TV B

95. University of Delaware, Newark
*George L. Hall, Dir., Teaching Resources Center A H J.4

96. Wesley College, Dover
*Lewis Wells L
*Richard Titus E

FLORIDA

97. Brevard Junior College, Cocoa
*William Kenneth Cumming, Dir., Educ. Services A C F.3 H I.2 J.4 K P Q R

98. Florida Atlantic University, Boca Raton
*Harvey K. Meyer, Dir. of Learning Resources A B C F.3 P Q

99. Florida State University, Tallahassee
*Duncan Hansen, Dir., C.A.I. Center J.1
*D. L. Hartford, C.A.I. Center J.1
*H. W. Stoker, C.A.I. Center J.1
*R. P. Kropp, Dir., Institute of Human Learning J.1

100. John B. Stetson University, De Land
*Gene Medlin H
*Eliot Allen H

101. Junior College of Broward County, Fort Lauderdale
*George Voegel, Dir., Instr'l Media A B J.3

102. Miami-Dade Junior College, Miami
*Frank Bouwsma B C E F.3 G H I.2 J.4 K L Q

103. Palm Beach Junior College, Lake Worth
*David M. Jenkins, AV Dir. E F.3 G L

104. University of Florida, Gainesville
*Robert B. Mautz, Vice Pres. A B E F.3
*K. A. Christiansen, Dir. of TV B C D E F.3 G J.4 L M

105. University of Miami, Coral Gables
*John A. Fiske, Jr., Production Dir. A G
*Muriel B. Hathorn, Dir., AV Q
*Samuel F. Harby, Prof. of Educ. Q R

106. University of South Florida, Tampa
*Gary C. Eichholz, Dir., Div. of Educ. Resources A C E F.3 L Q R

GEORGIA

107. Abraham Baldwin Agricultural College, Tifton
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*Walter D. Jones E F.3 G L
*Ann Clark E F.3 G L

112. Middle Georgia College, Cochran
*Eula Windham, Roberts Memorial Library E I.1 J.2

113. Morris Brown College, Atlanta
*James H. Penn, Dean J.4

114. The Woman's College of Georgia, Milledgeville
*S. C. Mangiafico, Head, Dept. of Modern Foreign Lang. F.3

HAWAII

115. University of Hawaii, Honolulu
*Richard Sanderson, Dir., Communication Center and Multi-Media K
*Robert Reed, Dir., KHET A G
*W. A. Wittich, Chr., Dept. of Educ. Communications Q R

IDAHO

116. Boise College
*R. H. Chatburn, Dean of Faculty E F.3 L

117. University of Idaho, Moscow
*Harry H. Caldwell, Chr., Geography & In-Service Training Communications B E F.3 G J.4 L O
*William Hall, Geology Dept. B E F.3 G J.4 L O

ILLINOIS

118. Bradley University, Peoria
*Philip Weinberg, Dir., Educ. TV Center A

119. Chicago City College, TV College
*James Zigerell, Asst. Dean, TV College A
*Hymen H. Chausow, Dean, TV Instr. A Q
*Clifford Erickson A

120. College of St. Francis, Joliet
*Sister Anita Marie, O.S.F., President A B E F.3 G J.1 L Q

121. Concordia Teachers College, River Forest
*Martin J. Neeb, Jr., Dir., Field Services A C Q

122. DePaul University, Chicago
*William E. Gorman B

123. Eastern Illinois University, Charleston
*H. H. Heller, Vice Pres. of Instr. B F.3

124. George Williams College, Chicago
*Paul Knapp, Librarian A C

125. Illinois College, Jacksonville
*Mary Louise Rainbolt F.1

126. Illinois State University, Normal
*William C. Briggs, Dir., AV Center B C D I.2 K L

127. Illinois Teachers College, Chicago-North
*Charles H. Stamps, Dir., Learning Services B K I.2

128. Illinois Wesleyan University, Bloomington
*Everette L. Walker, Dean B E F.3 G H L
*Lydia Holm, Dept. of Foreign Lang. F.2

129. Knox College, Galesburg
*Russell E. Swise, Dir. of Teaching Aids B C

130. Lewis College, Lockport
*Brother Richard Zimny E F.3 G

131. Lincoln College
*R. Wade, Registrar G

132. Loyola University of Chicago
*Henry Bussey, Dir., Radio and TV B

133. Lyons Township Junior College, La Grange
*Harold Betting, Dean J.2

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*Rev. Rafael R. Davila, Chr., Modern Foreign Lang. Dept. F.3 L

135. Monmouth College
*W. Novak, Dir., AV Center C

136. Monticello College, Godfrey
*John D. Schweitzer, Dean of Faculty E F.3 G L

137. National College of Education, Evanston
*Nancy G. Troyer, Dir. CCTV B E
*Arthur Stunard, Industrial Arts Educ. B E
*Stuart Vincent, Coord. Methods Blocks B E

138. Northern Illinois University, De Kalb
*Blanche Owens, Coord. of ETV A B
*Robert Hunyard, Dir. Instr'l Materials A B

139. Olivet Nazarene College, Kankakee
*S. D. Beeman, Asst. Dean F.2
*William D. Beaney, Dept. of Biology F.3 J.4 M Q

140. Principia College, Elsah
*Donald E. McCoy F.1 H
*Forbes Robertson, Prof. of Geology F.3
*Douglas B. Swett, Prof. of Foreign Lang. F.3 H

141. Rockford College
*Mrs. Roxy Alexander G

142. Roosevelt University, Chicago
*Horace Jimerson E
*Mathias Jenovai J.4
*Mrs. Horner F.3

143. Southern Illinois University, Carbondale
*Donald L. Winsor, AV Service I.2 K
*Harry Denzel I.2 K

144. Springfield Junior College
*Mrs. Maud Heldermann F.2

145. University of Illinois, Urbana
*Charles J. McIntyre, Dir., Office of Instr'l Resources A F.1 J.1 H
*Roger L. Johnson J.1
*Donald L. Bitzer J.1
*Elizabeth R. Lyman J.1
*J. A. Easley, Jr., J.1
*Bruce Hicks J.1
*William E. Montague J.1

146. University of Illinois at Chicago Circle
*John B. Haney, Dir., Office of Instr'l Resources A E H I.1

147. University of Illinois at the Medical Center, Chicago
*Mitchell Schorow, Center for the Study of Medical Educ. J.1 Q

INDIANA

148. Ball State University, Muncie
*O. T. Richardson, Dean, Instr'l Services D H
*William H. Tumlinson, Dir., Center for Radio & TV B

149. DePauw University, Greencastle
*Robert H. Farber, Dean of the University F.3 H I.1 J.1

150. Earlham College, Richmond
*M. Daniel Smith C H

151. Hanover College
*Harold J. Haverkamp, Dean E F.3 G I.2 L

152. Indiana State University, Terre Haute
*James Doyle, Dir., CCTV B F.3
*Russell McDougal, Dir., AV Center B I.2 K Q

153. Indiana University, Bloomington
*Gene Faris, AV Center Q R

154. Manchester College, North Manchester
*Philip Parker, Dir., AV Dept. E G H I.2 L

155. Purdue University, Lafayette
*Charles E. Wales, School of Chemical Engr. H K
*James S. Miles, TV Unit A
*J. Christopher Reid, Asst. Head, Instr. Media Research Unit J.1
*Warren F. Seibert J.1
*William Flint Smith, Dir., Lang. Lab. F.1 F.2 F.3
*S. N. Postlethwait, Prof. of Biology F.1
*L. D. Miller Q R
*D. J. Tendam E

156. Rose Polytechnic Institute, Terre Haute
*Richard H. F. Pao, Chr., Academic Development Council E F.3 G J.4 L P

157. Saint Mary-of-the-Woods College
*Sister Mary Josephine, Academic Dean C E G L
*Sister Mary Olive, Chr., Speech and Drama Dept. A V
*Sister Marie William, Chr., Dept. of Educ. H
*Sister Gertrude, Chr., Modern Lang. Dept. F.1

158. Taylor University, Upland
*Ross C. Snyder, Dir., Educ. Media Center Q R

159. Vincennes University
*John Walker, Science Dept. F.1
*Mrs. Harriett Crosscup, English Dept. F.1
*Warren Potter F.1

160. Wabash College, Crawfordsville
*Willis Johnson A

IOWA

161. Briar Cliff College, Sioux City
*Sister Mary Margaret Francis, Academic Dean M

162. Buena Vista College, Storm Lake
*John P. Williams, Acting Dean E F.3 L M

163. Clarke College, Dubuque
*Sister Mary Alexander, B.V.M. E F.3 G L
*Sister Mary Kenneth, B.V.M. J.2

164. Coe College, Cedar Rapids
*Robert E. Heywood, Business Manager F.3 J.4 L M

165. College of Osteopathic Medicine & Surgery, Des Moines
*Thomas Vigorito, Dean B E H I.2 L

166. Cornell College, Mount Vernon
*C. M. Cochran, Vice Pres. and Treasurer B F.2 M

167. Drake University, Des Moines
*Donald K. Moon, Dir. AV Services B F.2

168. Graceland College, Lamoni
*Roy Muir, Dir., Public Relations E G H
*R. L. Schall G L

169. Iowa State University, Ames
*G. C. Christensen, Vice Pres. for Academic Affairs A J.3

170. Iowa Wesleyan College, Mt. Pleasant
*Howard W. Johnston, Academic Dean B H

171. Luther College, Decorah
*Nels Forde L
*Odell Bjerkness F.3

172. Marycrest College, Davenport
*Sister Joan Sheil, AV Dir. B

173. State College of Iowa, Cedar Falls
*Robert Paulson, Dept. of Teaching A

174. University of Dubuque
*Charles W. Tyrrell I.2

175. University of Iowa, Iowa City
*Lee W. Cochran, Dir., AV Center E Q

176. Wartburg College, Waverly
*Richard Wiederanders E F.3 G L

177. Westmar College, Le Mars
*Delmer DeBoer, Dept. of Mathematics J.4

KANSAS

178. The College of Emporia
*Wynona J. Kirkpatrick, Academic Dean C G L

179. Fort Hays Kansas State College, Hays
*Calvin E. Harbin C E F.3 G H L

180. Friends University, Wichita
*Dale Jantze E

181. Hesston College
*Vincent Krabill E G L
*Paton Yoder, Dean E G L

182. Hutchinson Community Junior College
*George Cooper L

183. Kansas State College of Pittsburg
*Paul R. Lawrence, Dir., AV Center A F.2 I.1 K

184. Kansas State Teachers College, Emporia
*J. T. Sandefur, Coord. of Research C D
*Ted Surdy, Prof., Dept.of Biology F.1

185. McPherson College
*Dayton Rothrock F.3 L

186. Mount St. Scholastica College, Atchison
*Sister M. Audrey Aaron, O.S.B. E F.3 L
*Sister M. Helen Sullivan, O.S.B. H J.4
*Sister M. Malachy Kennedy, O.S.B. H J.4

187. Washburn University of Topeka
*Ian Wheeler, ETV A
*R. Stanley Alexander J.4

188. Wichita State University
*Mrs. Carol S. Holman, Dir., AV Services I.2 S
*K. N. Nickel, Head, Dept. of Educ. C

KENTUCKY

189. Brescia College, Owensboro
*Sister Maureen Browne, Dept. of Modern Lang. E F.3
*Sister DeChantal E G I.2 L

190. Centre College of Kentucky, Danville
*John W. Frazer, Asst. to the Pres. J.1

191. Eastern Kentucky University, Richmond
*James Harris, Dir., Div. of Instr'l Services B

192. Kentucky State University, Frankfort
*James Brown B

193. Morehead State University
*Norman Tant, Dir., Instr'l Media B

194. Western Kentucky University, Bowling Green
*Fred Haas, Coord., Educ. TV A F.2 J.3

LOUISIANA

195. Louisiana Polytechnic Institute, Ruston
*Paul J. Pennington, Dean A

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I.2 J.4 L U
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*J. C. Conaway, Prof. of Educ. A G

619. Oregon College of Education, Monmouth
*W. Kenneth Yost, Dir., Educ. Media Center B C E F.3 G H I.2 J.4 L O Q

620. Oregon State System of Higher Education, Monmouth
*Paul Twelker, Dir., Instr'l Variables Program Q
*Bert Y. Kersh Q

621. Oregon State University, Corvallis
*Harold Livingston, TV Coord. H
*Robert Reichart J.1

622. University of Oregon, Eugene
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*Fred Andrews J.4
*Glenn Starlin, Assoc. Dean A

623. University of Portland
*Harold H. Stauffer, Dir., Teacher Educ. D F.2

PENNSYLVANIA

624. Bloomsburg State College
*Thaddeus Piotrowski, Dir., AV Materials Center H F.3

625. Carnegie Institute of Technology, Pittsburgh
*A. Perlis J.1
*E. M. Williams H

626. Chatham College, Pittsburgh
*Doris Crozier, Asst. to the Pres. F.3 G J.4 L

627. Cheyney State College
*Samuel L. Curtis, Dir., CCTV B D F.2

628. Duquesne University, Pittsburgh
*Francis Kleyle, School of Education E F.3 G J.4 L Q

629. Gannon College, Erie
*Charles Alcorn, Dept. of Educ. D

630. Hahnemann Medical College and Hospital, Philadelphia
*Dr. Osterholm, Neurosurgery, Biological Institute B C
*Henry Schneider, M.D., Biological Institute B C
*Hugh D. Bennett, M.D., Assoc. Dean H
*Lawrence McGowan, M.D. H

631. Juniata College, Huntingdon
*Mrs. Connie Hurley, Secretary to the Pres. C E F.3 G H J.4 L

632. Keystone Junior College, La Plume
*John A. Hertz, Dean F.3
*Nasko Rusic F.3

633. King's College, Wilkes-Barre
*Jay A. Young C E H J.1

634. Lafayette College, Easton
*J. Marshall Brown, Psych. Dept. A

635. Lebanon Valley College, Annville
*Howard A. Neidig, Chr., Dept. of Chemistry H

636. Lincoln University
*James Frankowsky E
*Roy Queenan E

637. Lycoming College, Williamsport
*David G. Wolbesley, Chr., Dept. of Biology A

638. Mansfield State College
*Thomas Rahnlean B

639. Marywood College, Scranton
*Sister M. Michael, Chr., Graduate Div D E F.3 G
*Sister M. Constance, Chr., Dept. of Librarianship F.2

640. Melton Research Center, Philadelphia
*Rabbi David Mossburg F.3 G

641. Mount Aloysius Junior College, Cresson
*Sister Mary Ursula, Pres. E F.3 L
*Sister Mary Cecilia G H
*Sister Mary Alphonsus T

642. Muhlenberg College, Allentown
*Roland Dedekind J.4
*William M. French A

643. The Pennsylvania State University, University Park
*Leslie P. Greenhill, Dir., Instr'l Services B C E J.1 J.2 J.3 K P Q R
*Harold E. Mitzel J.4
*C. Ray Carpenter A C E J.1 P Q R

644. Philadelphia College of Textiles & Science
*G. L. Marvin, Jr., Dir., AV Educ. B E

645. Shippensburg State College
*Paul Gney, Dean of Academic Affairs A I.1 J.4

646. Temple University, Philadelphia
*Warren S. Owens, Dir., University Libraries C
*George J. Edberg, Chr., Lang. Lab. Committee F.3
*Thomas D. Stone, College of Educ. H I.2
*Thomas W. Evaul, College of Educ. H
*John S. Roberts, School of Communications and Theatre A D E K
*Val Udell, Dir., AV Center E L Q
*William H. Siebel, Dir., Instr'l TV A B C D K M O
*Leonard J. Garrett, Dir., Computer Center H J.4

647. Thiel College, Greenville
*Richard W. Solberg, Academic Dean E F.3 L

648. University of Pennsylvania, Philadelphia
*Hugh M. Shafer, Assoc. Prof. of Educ. B
F.2 H I.1 J.1

649. University of Pittsburgh
*C. Walter Stone, Dir., University Libraries
I.1 J.1
*C. R. Moore, Dept. of Social Psych. P
*Edwin L. Peterson L

650. University of Scranton
*Joseph A. Rock, S.J., Academic Vice Pres.
E F.3 J.8 L

651. Villanova University
*Rev. John M. Driscoll, O.S.A., Vice Pres. for Academic Affairs B

652. West Chester State College
*William Leeds, Asst. Academic Affairs S
*Arnold Fletcher, Dean, Academic Affairs S

653. Westminster College, New Wilmington
*Robert F. Galbreath, Jr., Coord., AV Aids
E F.3 G L

654. Wilson College, Chambersburg
*Martha Church, Dean B E F.3 G J.8 L

RHODE ISLAND

655. Providence College
*Paul van K. Thomson, Academic Vice Pres.
E F.2 J.1

656. Rhode Island College, Providence
*Anthony Giardino B

657. Roger Williams Junior College, Providence
*Walter H. Hobbs, Jr. F.1 H S
*Ralph E. Gauvey, Pres. B S
*Absalom F. Williams F.1
*Edwin F. Hallenbeck, Vice Pres. for Financial Affairs F.1 H

658. The University of Rhode Island, Kingston
*Oscar J. Hicks, AV Dir. A B K Q

SOUTH CAROLINA

659. The Citadel, Charleston
*Earl O. Kline, Prof., Political Science Dept. J.1 J.2
*L. K. Himelright, Civil Engineering Dept.
J.1 J.2

660. Claflin College, Orangeburg
*Ernest A. Finney, Dean A

661. Clemson University
*Arthur F. Jensen, School of Educ. L

662. Morris College, Sumter
*James L. Solomon, Jr., Chr., Div. of Natural Sciences E F.3 L

663. Voorhees College, Denmark
*W. T. Fontellio-Nanton, Dean A B F.3 H
*Mrs. Mildred B. Ford A B F.3 H

664. Wofford College, Spartanburg
*L. P. Jones E F.3 G L
*G. C. S. Adams E F.3 G L

SOUTH DAKOTA

665. Augustana College, Sioux Falls
*Tom Kilian, Vice Pres. for Development A
*G. Schmutterer F.3
*J. D. Thompson J.8
*Oscar Okaal B C

666. South Dakota State University, Brookings
*W. F. Wentzy, Supervisor, Instr'l TV A B

667. University of South Dakota, Vermillion
*D. M. Colwell, Dir., Educ. Media Center
B C I.2

TENNESSEE

668. Belmont College, Nashville
*Edward Nipper, Chr., Business Admin. C E
F.3 J.1
*Mrs. Evelyn B. McCulloh, Speech Dept. C E
F.3 J.1
*Virginia M. Chaney, Chr., Foreign Lang. Dept. C E F.3 J.1

669. East Tennessee State University, Johnson City
*Fred C. Cobun A B

670. Fisk University, Nashville
*Rutherford B. Adkins, Acting Chr., Dept. of Physics J.1 J.3

671. George Peabody College for Teachers, Nashville
*Curtis P. Ramsey, Dir., Learning Resources Center B C G H J.2 L N Q R

672. Knoxville College
*Christopher M. Reynolds, AV Dir. B C H

673. Memphis State University
*Ronald S. Alford, Asst. Public Information Dir. A B E F.3 G J.8 L N U

674. Milligan College
*Donald R. Shaffer B F.3 G
*Glen Owen B F.3 G
*Guy Oakes, Dean G

675. Tennessee Technological University, Cookeville
*James S. Brown, Dean S
*Odell M. Hearn, Dean S

676. University of Chattanooga
*Allison v. Slagle, Prof., Dir. of AV Center
B F.3 G H J.3 K L

677. The University of the South, Sewanee
*Donald B. Webber F.3
*H. M. Owen L
*Ralph Penland J.4

678. University of Tennessee, Knoxville
*Ohmer Milton, Learning Resources Center B H

TEXAS

679. Abilene Christian College
*Orval Filbeck, Head, Dept. of Educ. B

680. Amarillo College
*Hardy Stevens, Dean A

681. Arlington State College
*Bill Meacham, Biology Department A
*Thomas Rain, Dean, Academic Affairs A J.8
G

482. Austin College, Sherman
*Dan T. Bedsole J.1

483. Cooke County Junior College, Gainesville
*Mrs. Ona Wright G L
*Charles Smith F.3 J.4
*James Crump G L
*Mrs. Charlotte Davis F.3 J.4
*John Blevins G L

484. Del Mar College, Corpus Christi
*Frank D. Hankins, Librarian E F.3 G L

485. Lee College, Baytown
*Walter Rundell, Dean F.3 L

486. Midwestern University, Wichita Falls
*R. W. Quick, Vice Pres. B J.2
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487. North Texas State University, Denton
*Darrell Dunham C

488. Our Lady of the Lake College, San Antonio
*Sister Frances Jerome Woods A J.2

489. San Antonio College
*Paul R. Culwell, Dean A

490. Southwest Texas Educational TV Council, Austin
*Harvey Herbst, Station Mgr. KLRN C D

491. Southwest Texas State College, San Marcos
*Joe H. Wilson, Vice Pres. A

492. Stephen F. Austin State College, Nacogdoches
*J. N. Gerber, Dean B C J.4 L
*Carl Saul, Head, Dept. of Modern Lang. F.3
*E. L. Miller, School of Sciences and Mathematics A
*George Hardin, Dir., Data Processing Center J.4

493. Sul Ross State College, Alpine
*Bob W. Miller, Prof. of Educ. T

494. Tarleton State College, Stephenville
*Paul A. Cunyus, Dean B D J.1

495. Texas A & M University, College Station
*Lee Martin, Educ. TV A B
*H. M. Hodges, Chemistry Dept. A M

496. Texas Christian University, Fort Worth
*A. A. J. Hoffman, Dir., Computer Center J.1
*Herbert F. LaGrone, Dean C

497. Texas Lutheran College, Seguin
*William C. Sherwood F.3

498. Texas Southern University, Houston
*A. N. Thompson E

499. Texas Technological College, Lubbock
*Harley Oberhelman A F.3
*D. M. McElroy, Station KTXT A F.3

500. Texas Woman's University, Denton
*A. Wallace Woolsey, Chr., Dept. of Foreign Lang. F.3
*Ivan L. Schulze, Librarian Q
*Josh P. Roach, Chr., Dept. of Speech B

501. Trinity University, San Antonio
*Jess C. Carnes, History Dept. B F.3 H J.4 L

502. Tyler Junior College
*E. M. Potter, Vice Pres. F.2 J.3

503. The University of Houston
*Edward G. Holley, Dir. of Libraries I.1 J.3
*C. Dwight Dorough, Dept. of English H
*Joe B. Wyatt, Dir., University Computer Center J.1
*Mrs. Dorothy Sinclair, KUHT-TV A
*Richard I. Evans, Prof. of Psych. A E

504. The University of Texas, Austin
*Howard Rase, Chr., Dept. of Chemical Engr. F.1 G U
*Page Keeton, Dean, School of Law D
*Wayne Holtzman, Dean, College of Education J.1
*Robert Schenkkan, Dir., Radio-TV A
*John W. Meaney, Radio-TV-Film A B U
*C. Victor Bunderson J.1
*William D. Muehlberger C

505. University of Texas, Texas Western College, El Paso
*Richard W. Burns, Office of Institutional Studies A H P
*Virgil C. Hicks, Head, Radio-TV B C

UTAH

506. Brigham Young University, Provo
*E. J. Clark A B
*D. J. Monson F.2 G
*Irwin Goodman E L

507. College of Southern Utah, Cedar City
*Harl E. Judd B M

508. University of Utah, Salt Lake City
*Dell Ogden, Dir., Instr'l TV B
*W. Donald Brumbaugh, Dir., Educ. Media Center Q B
*David C. Evans J.4
*Sue L. Campbell E U
*Gabriel Della-Piana M

509. Utah State University, Logan
*Lester C. Essig, Head, Dept. of Instr'l Media B E F.3 I.2 L M

VERMONT

510. Green Mountain College, Poultney
*Lawrence W. Boothby M
*Mrs. Elaine Parsons F.3 I.2 L

511. Middlebury College
*James M. Watkins F.3

512. Vermont College, Montpelier
*William L. Irvine, Pres. M

VIRGINIA

513. Bridgewater College
*John White J.4

514. College of William & Mary, Williamsburg
*C. H. Reeder, AV Dept. B C E F.3 J.4 L

515. Longwood College, Farmville
*Charles H. Patterson, Chr., Educ. & Psych. Dept. B

516. Lynchburg College
*Donald J. McCants, Dir., Educ. Computer Center J.4

517. Madison College, Harrisonburg
*Walter Hash, Jr., Coord., ETV B

518. Medical College of Virginia, Richmond
*W. Shaffer, Dir., Visual Educ. Dept. A

519. Norfolk Branch, Virginia State College
*Stanley McIntosh, Exec. Dir. A

520. Randolph-Macon College, Ashland
*Gerald L. Engel J.1
*Wade J. Temple J.1
*Richard E. Grove, Dir., Computer Center J.1

521. University of Virginia, Charlottesville
*Alan Batson T
*Roger P. Bristol B

522. The Virginia Military Institute, Lexington
*Gabriel G. Balazs, Dir., Computer Center J.4

523. Virginia Polytechnic Institute, Blacksburg
*Willis G. Worcester, Dean H

524. Virginia State College, Petersburg
*Harry A. Johnson, Dir., AV Center B C E H L N Q T

WASHINGTON

525. Central Washington State College, Ellensburg
*Charles Vlcek, AV Center B C

526. Clark College, Vancouver
*Elmer Dravdahl, Dean of Occupational Educ. E F.3 G H J.4 L

527. Eastern Washington State College, Cheney
*Thomas Keith Midgley, Dir., Instr'l Communications Center H I.2 K L S

528. Everett Junior College
*Michael Baker A H I.1 J.4
*C. Alan Tucker A H I.1 J.4
*G. Harvey Van Askel A H I.1 J.4

529. Pacific Lutheran University, Tacoma
*Frank H. Haley, Librarian A B C I.2 J.3 L

530. Shoreline Community College, Seattle
*Stephen Gerhardt, Dir., Instr'l Resources F.3

531. Skagit Valley College, Mt. Vernon
*Hendrik Slickers, Librarian & AV Dir. E F.3 G L

532. University of Washington, Seattle
*Boyd F. Baldwin, Coord., AV Educ. M Q S
*Walter P. Dunn, Coord., CCTV B H
*Ralph E. Pearson, Chief, Motion Picture Production E
*Thomas A. Stebbins, Dir., Health Sciences E
*C. M. Torkelson, Prof. of Educ. H
*George Buck, Dir., Lang. Lab. F.1 F.2 F.3

533. Walla Walla College
*Dale Wagner B C
*Robert E. Stahlnecker B C

534. Washington State University, Pullman
*Robert Grunewald, College of Educ. B
*Gerald R. Brong, Asst. Dir., AV Center B

535. Western Washington State College, Bellingham
*Will Riddles C

536. Whitworth College, Spokane
*Jasper H. Johnson, Dir., AV Center E I.2 L O S

WEST VIRGINIA

537. Bethany College
*Gary E. Larson, Acting Chr., Biology Dept. B H

538. Fairmont State College
*James LaRue L
*Stark Wilmoth L
*Billy C. Dunn J.4
*Gerald McClurg J.4
*James A. Hales E

539. Marshall University, Huntington
*Walter Felty S

540. Morris Harvey College, Charleston
*Clarence Tamplin A

541. Potomac State College of West Virginia University, Keyser
*James T. Handlan, Academic Dean H J.4

542. Salem College
*Robert Florian M

543. West Virginia University, Morgantown
*John Luchok L
*Ernest Jones J.4
*Robert Stillwell F.3
*C. Gregory Van Camp A E

544. West Virginia Wesleyan College, Buckhannon
*Walter L. Brown, Asst. Dean A E F.3 G H I.2 J.4 K L N Q

WISCONSIN

545. Beloit College
*William Dunteman, Assoc. Dean of the College A E F.3 G I.2 J.4 L

546. Lawrence University, Appleton
*John Church J.4

547. Milwaukee Vocational Technical and Adult Schools
*Francis Rvolanek I.1
*Marian Madigan H
*Otto Schlaak A

548. St. Norbert College, West De Pere
*Neil J. Webb, Psych. Dept. G T
*Thomas F. Grib, Psych. Dept. G T

549. Stout State University, Menomonie
*D. P. Barnard, Chr., AV Dept. B E H
*Larry K. Sedgwick B E H
*Marlyn T. Wiefeldt B E H

550. University of Wisconsin, Madison
*R. E. Majem, Dir., Articulated Instr'l Media S T
*Lee Dreyfus, Radio-TV A T
*James Robertson, Radio-TV Dir. A T
*Mrs. Barbara Newell, Asst. to the Chancellor T
*Maxine E. McDivitt, Dept of Foods and Nutrition H
*Gerald McVey, Mgr., Multimedium Instr'l Lab. E

551. Wisconsin State University, Eau Claire
*Richard Beckman, Dir., AV Services A L

552. Wisconsin State University, La Crosse
*W. Sparks F.1
*Dean T. Wick A
*Donald L. Nicholas H
*V. B. Rasmusen, Dir., AV Center B F.3 J.3

553. Wisconsin State University, Oshkosh
*Frederick J. C. Mundt A F.2 J.1

154. Wisconsin State University, Platteville
*Glenn C. Brooks, AV Dir. A

155. Wisconsin State University, River Falls
*Alton Jensen E
*Ernst Jurgens F.1
*Robert Krueger B C L

156. Wisconsin State University, Stevens Point
*Frederick A. Kremple E F.2 L
*G. D. Lewis, Dir., Instn'l Media Services B F.2 P

157. Wisconsin State University, Superior
*John Guckin, Dir., AV Educ. B E F.3 G L
*Cleo Cassidy, Dean J.4
*Gayle Marrion, Dept. of Speech A

158. Wisconsin State University, Whitewater
*Rolland F. Schliewe I.2 M

WYOMING

159. University of Wyoming, Laramie
*John D. Alford, Coord., AV Services E

WASHINGTON, D.C.

160. District of Columbia Teachers College
*Paul Cooke, Pres. E F.1 G H I.1 L
*Mrs. Juanita D. Fletcher, Asst. Prof. A

161. Dunbarton College of Holy Cross
*Sister Mildred Dolores, Pres. H I.1

162. The George Washington University
*G. H. Ausman, Dir., Lang. Lab. F.3 G H J.4 L Q

163. Howard University
*Joseph H. Applegate F.3 S
*Charles G. Hurst, Jr. F.3 S
*J. Edwin Foster F.3 S

164. Immaculata College of Washington
*Sister Maria Agatha, Pres. A E F.3 G L

165. Mount Vernon Junior College
*Flora Harper, Asst. to the Pres. E F.2 L

166. Canal Zone College, Balboa Heights
*Gary T. Peterson, AV Coord. G L Q

PUERTO RICO

167. University of Puerto Rico, Rio Piedras
*Teofila C. de la Luz, Dir., AV Center E F.3 L
*Ethel Rios de Betancourt A F.3
*Aida Vergne A F.3
*Lorna Abbott A F.3

* * *

ADDENDUM

ALABAMA

X-1. Maxwell Air Force Base (Department of the Air Force)
*Wendall A. Hammer, Colonel, USAF, Dir. of Academic Instr. B C

CALIFORNIA

X-2. Foothill College, Los Altos Hills
*Frederick Kritchfield, AV Coord. B C E F.3 H I.2 J.4 K L O P Q

X-3. University of California at Irvine
*William J. Stead, Dir., AV Communication B C F.3 H I.2 J.3 K Q R

X-4. University of California at Los Angeles
*Frank E. Hobdun, Dir., Academic Communications Facility B C D E I.2 Q

ILLINOIS

X-5. Northwestern University, Evanston
*Charles Hunter, Prof. of Educ. B C E F.3 G I.2 J.3 J.4 L O Q U

MARYLAND

X-6. Anne Arundel Community College, Severna Park
*James D. Forman, Dir. of Engineering Tech. C G I.2 K Q

X-7. Towson State College, Baltimore
*David Cornthwaite, Coord. of AV Materials B E F.3 H I.2 J.2 K L O Q
*William Hartley, Prof. of Educ. B E F.3 H I.2 J.2 K L O Q

MISSOURI

X-8. Central Methodist College, Fayette
*Virgil A. Warren F.3

NEW JERSEY

X-9. Montclair State College, Upper Montclair
*Emma Fantone, Dir., AV Center C E F.3 L M N O R

NEW YORK

X-10. Fordham University, New York
*William K. Trivett, S.J., Chr., Communication Arts Dept. E G U
*John J. Culkin, S.J., Dir., Film Study Center A E

X-11. State University of New York at Stony Brook
*Richard F. Hartzell, Exec. Producer, I.R.C. J.1

NORTH CAROLINA

X-12. The University of North Carolina at Charlotte
*Frank B. Whittacre, AV Coord. L R

TEXAS

X-13. Texas Educational Microwave Project, Austin
*Hugh Greene, Coord. and Co-Dir., TEMCON *TUSW A C

VIRGINIA

X-14. U. S. Naval Weapons Laboratory, Dahlgren
*Gerald L. Engel, Programming Systems Branch J.1

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